



# 48LJ, 50LJ/LW024 Single-Package Cooling Units

## Installation, Start-Up and Service Instructions

### SAFETY CONSIDERATIONS

Installation and servicing of air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service air conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and the other safety precautions that may apply.

Follow all safety codes, including ANSI Z223.1-1984. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

#### ⚠ WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personnel injury.

#### FOR YOUR SAFETY WHAT TO DO IF YOU SMELL GAS

Do not try to light any appliance. Do not touch any electrical switch; do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you cannot reach your gas supplier, call the fire department.

#### FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

#### ⚠ WARNING

Improper installation, adjustments, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information, consult a qualified installer, service agency or the gas supplier.

#### ⚠ CAUTION

Disconnect gas piping from unit when leak testing at pressures greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, the unit connected to such piping must be isolated by manually closing the gas valve.

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## INSTALLATION

This book contains instructions for 48/50LJ vertical supply/return units and 50LW horizontal supply/return units.

**IMPORTANT:** These units are not designed for handling by forklift trucks.

**Rigging and Unit Placement** — Inspect unit for transportation damage. File claim with transportation agency. Do not drop unit; keep upright. Use spreader bars over unit to prevent sling or cable damage. Rollers may be used to move unit across a roof. Level by using unit frame as reference. See Fig. 1 for additional information. Unit physical data is shown in Tables 1a and 1b.

**Roof Curb** — Assemble and install as described in instructions shipped with this accessory. Accessory roof curb and information required to field fabricate a roof curb is shown in Fig. 2a and 2b. Install insulation cant strips, roofing and counter flashing as required. For unit drains to function properly, curb must be level or within tolerances shown in Fig. 3.

**Roof Mount** — Check building codes for weight distribution requirements. Unit weight is shown in Tables 1a and 1b.

**Slab Mount** — Provide a level concrete slab that extends beyond unit cabinet at least 6 inches. Make a slab 8-in. thick with 4 in. above grade. (For condensate drain to

function properly, slab must be at least 4 in. above grade. See Fig. 4.) Use gravel apron in front of condenser air inlet to prevent grass and foliage from obstructing airflow.

**Alternate Unit Support Methods** Where the preferred curb or slab mount cannot be used, support unit with sleepers on perimeter, using curb support area. However, if sleepers cannot be used, support long sides of unit (see Fig. 5a — 5c) with three 4-in. x 4-in. pads equally spaced. Unit may sag if supported by corners only.

**Positioning** — Provide clearance around and above unit for airflow, safety, and service access. Allow 12 ft above the unit, and at least 4 ft on all sides for rated performance and code compliance. If unit has economizer, allow 6 ft clearance on that side. For preferred service access, allow 6 ft clearance on all sides.

Do not install unit in an indoor location. Do not locate air inlets near exhaust vents or other sources of contaminated air.

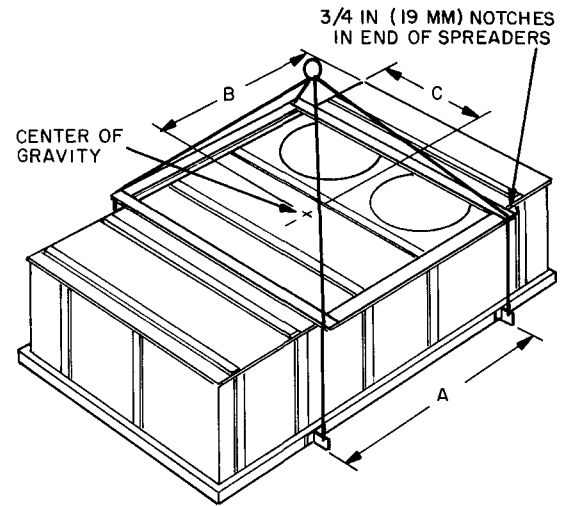
Although unit is weatherproof, guard against water from higher level runoff and overhangs.

**IMPORTANT:** Always line up the condenser end of the unit tight against the roof curb.

**NOTES:**

- 1 Rig with 4 cables and spread with two 95-in. (2413-mm) and 2 "A" long suitable spreader bars.
- 2 Center of gravity and unit weight include economizer, but not economizer hood

<b>⚠ CAUTION</b>
1 All panels must be in place when rigging.
2. Unit is not designed for handling by forklift truck.



**NOTICE TO RIGGERS**

MODEL	UNIT WEIGHT		A		B		C	
	Lb	Kg	In.	mm	In.	mm	In.	mm
48LJD	2895	1313	85.91	2182	61	1549	43	1092
49LJE	2975	1349	85.91	2182	61	1549	43	1092
50LJ	2565	1164	6.14	1680	49	1245	44	1118
50LW	2775	1259	85.91	2182	61	1549	43	1092

**ACCESSORY/OPTION WEIGHTS**

ROOF CURB		ECONOMIZER WITHOUT HOOD		ECONOMIZER HOOD		POWER EXHAUST/ BAROMETRIC RELIEF HOOD	
Lb	Kg	Lb	Kg	Lb	Kg	Lb	Kg
280	127	140	63.6	155	70.3	130	59.1

**Fig. 1 – Rigging Label**

**Field-Fabricated Ductwork** — Secure all ducts to building structure, using flexible duct connectors between roof curb and ducts as required. Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier. Outlet grilles must not lie directly below unit discharge.

**48LJ UNITS** — These units are field-convertible with the use of an accessory horizontal conversion kit. They are shipped from the factory as vertical supply/return, but may be field converted to horizontal supply/return.

Attach field-fabricated ductwork to the roof curb. The return-air duct connection (inside dimensions) is 46.75-in. long x 30.59-in. wide; the supply-air duct connection (inside dimensions) is 38.63-in. long x 27-in. wide. Connect ductwork to 16-gage roof curb material. Secure all ducts to the building structure, using flexible duct connectors between roof curb and ducts as required. Ducts passing through an unconditioned space must be insulated and covered with a vapor barrier. Outlet grilles must not lie directly below unit discharge. The return duct must have a 90-degree elbow before opening into the occupied building space if unit is equipped with power exhaust.

Vertical discharge ducts are designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended that the ducts be supported by cross braces as shown for accessory roof curb. Duct should be the same size as shown on the roof curb certified drawing.

Units may be connected to horizontal supply/return ductwork with the use of the accessory horizontal conversion package.

**50LJ UNITS** — On these units, attach field-fabricated ductwork to roof curb. The return-air duct connection (inside dimensions) is 49.81-in. long x 30.59-in. wide; the supply-air duct connection (inside dimensions) is 37.87-in. long x 31.02-in. wide. Connect ductwork to 16-gage roof curb material. (See installation instructions shipped with accessory roof curb.)

**50LW UNITS** — On these units, attach field-fabricated ductwork to factory-supplied duct flanges mounted on the side of the unit. See Fig. 5c. Duct flange height is approximately one inch; flange is 18-gage sheet metal. The horizontal supply and return duct openings (inside dimensions) are 26.85-in. wide x 42.03-in. high.

**Table 1a – Physical Data, 48LJ Units**

BASE UNIT 48LJ	D024	E024
NOMINAL CAPACITY (tons) lb	20	20
OPERATING WEIGHT (lb)*	2895	2975
COMPRESSORS (2 each unit) Capacity Steps (%)	Hermetic, 3600 Rpm 50, 100	
REFRIGERANT Operating Charge (lb), Sys 1/Sys 2	R-22 Controlled by Acutrol™ Metering Device 16 0/16.0	
CONDENSER COILS Face Area (sq ft) Fins Per in. (Al)	3-Row, 3/8-in. Tube Diameter 24.75 17.0	
EVAPORATOR COILS Face Area (sq ft) Fins Per In.	4-Row, 3/8-in. Tube Diameter 20.3 15	
FURNACE SECTION		
Number of Heat Exchangers	5	10
Input (MBtuh)	242	475
Output (MBtuh)	194	380
Temperature Rise (°F)	10-40	30-60
Burner Orifice Diameter (in. ...drill no.)	.129...30	.129...30
Pilot Orifice Diameter (in. ...drill no.)	.046...56	.055...54
Firing Stages	2	2
Number of Gas Valves	1	2
CONDENSER FANS (2 each unit) Nominal Cfm Nominal Hp	Propeller Type, 30-in. Diameter, 1130 Rpm 13,000 1 0	
EVAPORATOR FANS (1 each unit)† Nominal Cfm Maximum Allowable Cfm Maximum Allowable Rpm	Centrifugal Type, 18 x 15-in., 1.438-in. Fan Pulley Bore 8,000 10,000 1,200	
Standard Motor and Drive Motor Hp Full Load Efficiency (%) Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Resulting Fan Rpm	1750 Rpm 5 84.3 184T 10.6 4.75 780	
Optional Motor and Drive Motor Hp Full Load Efficiency (%) Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Resulting Fan Rpm	1750 Rpm 7.5 84.8 213T 8.0 4.12 900	
Optional Power Exhaust Motors...Hp Fans...Diameter (in.)	Propeller Type, 1140 Rpm 1.. 1.0 1 .24	
Filters (Quantity...L x W xD) 20% Standard Efficiency Disposable	2. 18 x 24 x 2 4...24 x 24 x 2	

\*Weights include economizer, but not rainhood. See Fig. 1 for weights of options and accessories.

†Standard fan motor is supplied with standard fan drive and belts. Optional motor is supplied with optional fan drive, pulleys, and belts. Other combinations are field supplied.

**Table 1b – Physical Data, 50LJ/LW Units**

BASE UNIT 50	LJ024	LW024
NOMINAL CAPACITY (tons)	20	20
OPERATING WEIGHT (lb)*	2565	2775
COMPRESSORS (2 each unit) Capacity Steps (%)	Hermetic, 3600 Rpm 50, 100	
REFRIGERANT Operating Charge (lb), Sys 1/Sys 2	R-22 Controlled by Acutrol™ Metering Device 16.0/16.0	
CONDENSER COILS Face Area (sq ft) Fins Per In. (Al)	3-Row, 3/8-in. Tube Diameter 24.75 17.0	
EVAPORATOR COILS Face Area (sq ft) Fins Per In.	4-Row, 3/8-in. Tube Diameter 20.3 15	
CONDENSER FANS (2 each unit) Nominal Cfm Nominal Hp	Propeller Type, 30-in. Diameter, 1140 Rpm 13,000 1.0	
EVAPORATOR FANS (1 each unit)† Nominal Cfm Maximum Allowable Cfm Maximum Allowable Rpm	Centrifugal Type, 18 x 15-in., 1.438 in. Fan Pulley Bore 8,000 10,000 1,200	
Standard Motor and Drive Motor Hp Full Load Efficiency (%) Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Resulting Fan Rpm	1750 Rpm 5 84.3 184T 10.6 4.75 780	
Optional Motor and Drive Motor Hp Full Load Efficiency (%) Motor Frame Size Fan Pulley Pitch Diameter (in.) Motor Pulley Pitch Diameter (in.) Resulting Fan Rpm	1750 Rpm 7.5 84.8 213T 8.0 4.12 900	
Optional Power Exhaust** Motors...Hp Fans...Diameter (in.)	Propeller Type, 1140 Rpm 1. 1 1...24	
Filters (Quantity...L x W xD) 20% Standard Efficiency Disposable	2...18 x 24 x 2 4 ...24 x 24 x 2	

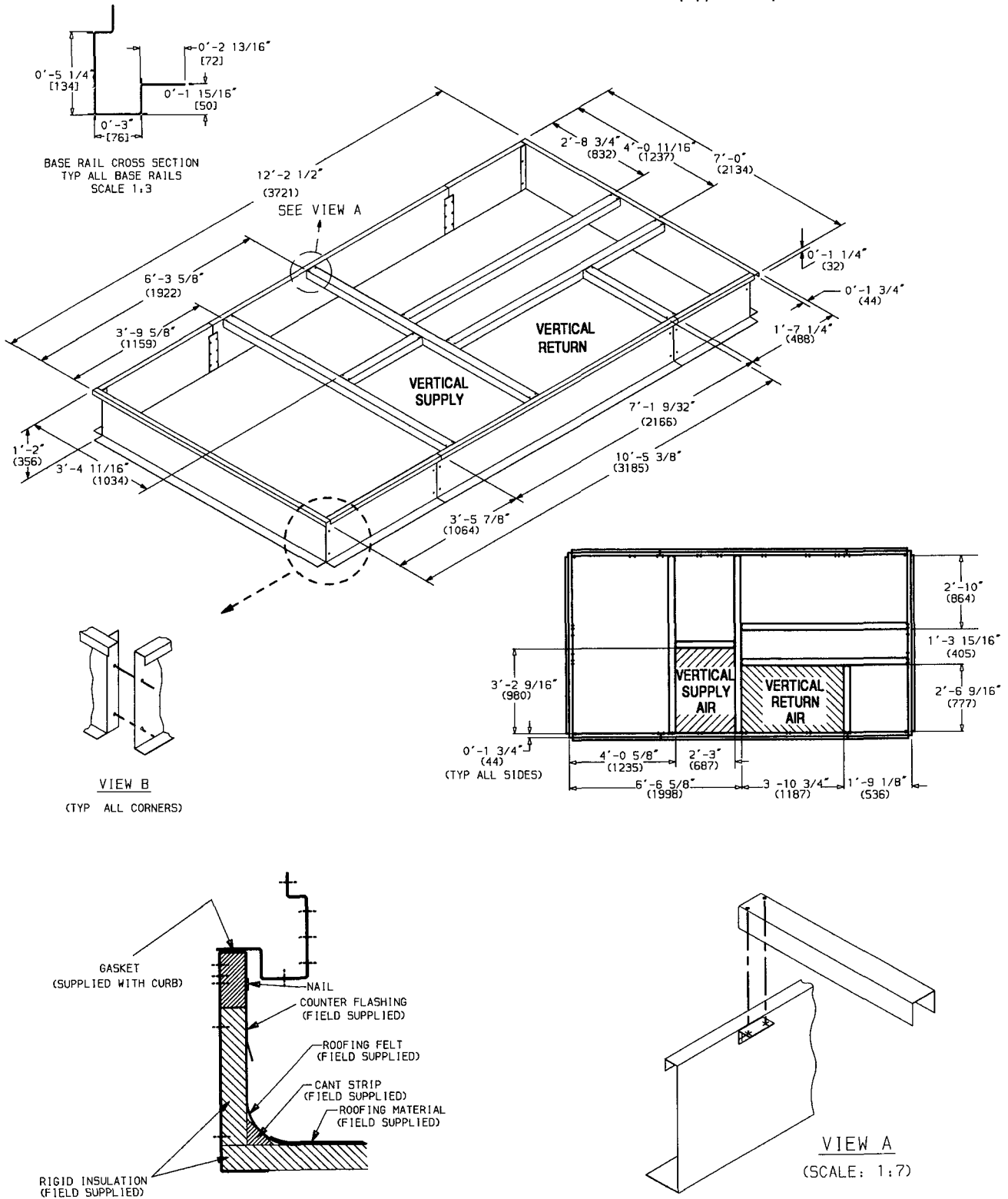
\*Weights include economizer, but not rainhood. See Fig 1 for weights of options and accessories.

†Standard fan motor is supplied with standard fan drive, pulleys and belts. Optional fan motor is supplied with optional fan drive, pulleys, and belts. Other combinations are field supplied.

\*\*Optional unit-mounted power exhaust not available on Model 50LW. Accessory power exhaust may be duct mounted on 50LW installation.

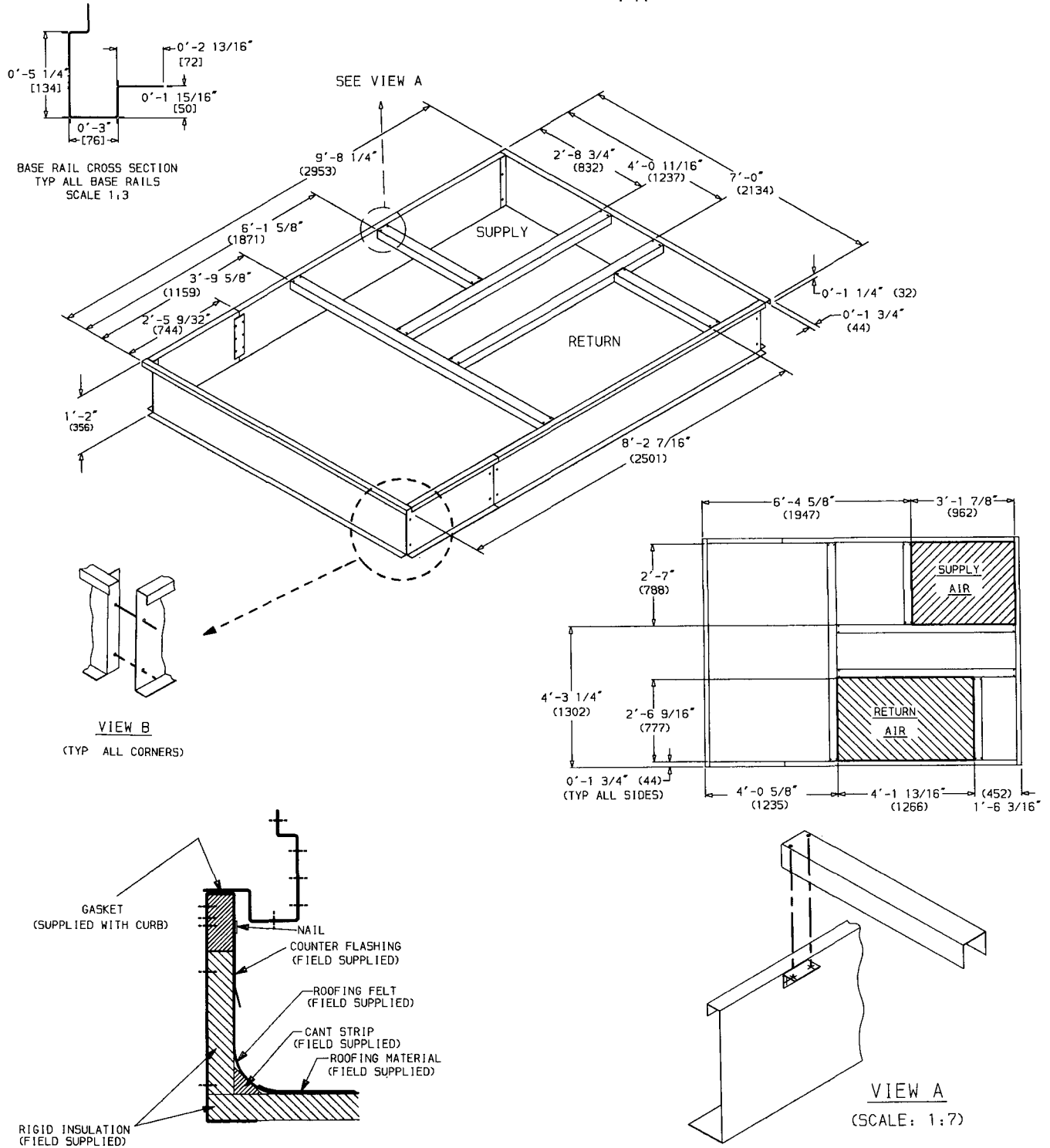
**NOTES:**

1. Roofcurb accessory 50DJ900401 is shipped disassembled.
2. Dimensions in ( ) are in millimeters.
3. Roofcurb: 16 gage steel.
4. A 90 degree return duct elbow shall be provided for vertical return units equipped with power exhaust

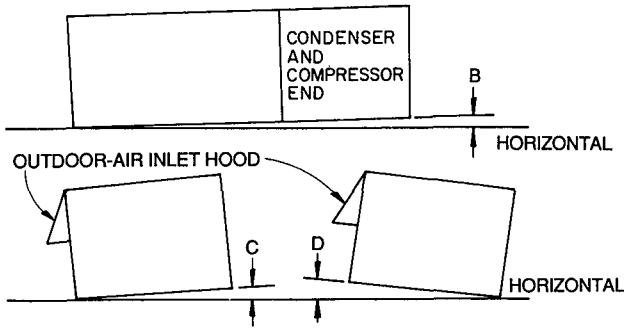


**NOTES:**

1. Roofcurb accessory 50DJ900391 is shipped disassembled.
2. Dimensions in ( ) are in millimeters.
3. Roofcurb: 16 gage steel.
4. A 90 degree return duct elbow shall be provided for vertical return units equipped with power exhaust
5. A 90 degree supply duct elbow shall be provided for units equipped with electric heat



**Fig. 2b – Roof Curb Details, 50LJ024 Units**



NOTE: To prevent the hazard of stagnant water build-up in the drain pan of the evaporator section, unit can only be pitched as shown. See Table 1 for allowable B tolerances.

UNIT	DIMENSIONS (degrees and in.)					
	B		C		D	
	Deg	In.*	Deg	In.*	Deg	In.*
48LJ	1.38	4.00	.50	.75	.50	.75
50LJ	1.00	3.25				
50LW	1.38	4.00				

\*From edge of unit to horizontal

Fig. 3 – Unit Leveling Tolerances

**Condensate Drain** — See Fig. 5a - 5c for drain location. A drain assembly consisting of a 10-gage plate with 1¼ in. half coupling welded to it is shipped inside the base unit, taped to the basepan in the filter section. Open the access panel marked FILTER SECTION and fine drain assembly and the 4 screws required to mount it in the left-hand corner. After unit has been set in place on the roof, remove drain assembly and attach it to the bottom of the unit base rail using the screws provided. See Fig. 4. Use a trap at least 4-in. deep and protect against freeze-up.

On slab mount applications, and when mounted on sleepers, seal hole in bottom of base rail and attach drain assembly as low as possible to side of base rail.

NOTE: Drain hole must be drilled in rail. There is no factory-supplied drain hole in the side of the base rail.

### Outdoor-Air Inlet Adjustments

#### ECONOMIZER SETTINGS

**Enthalpy Sensor (Fig. 6)** — This sensor is located on the partition separating the outdoor air from the return air. See Fig. 7. The enthalpy setting adjustment is on the top of the economizer motor. See Fig. 8. For maximum benefit of outdoor air, set enthalpy control to the A setting. See Fig. 8 and 9.

**Mixed-Air Thermistor** — The mixed-air thermistor (MAT) set point adjustment is on the top of the economizer motor. This motor is located in the return-air section, and is accessed by opening the access panel marked FILTER SECTION. See Fig. 8. Set MAT set point adjustment dial to the desired setting. The factory setting is 55 F ± 5° F; the range is 40 to 90 F. The MAT is located on the filter rack.

**Minimum Damper Position Set Point** — The minimum position adjustment is located on the cover of the economizer motor. See Fig. 8. Adjust by setting the fan switch to ON position (continuous fan operation), and setting the system selector switch to OFF position. Then turn adjustment screw slowly until the dampers assume the desired vent position. Do not manually operate the damper motor, damage to the motor may result.

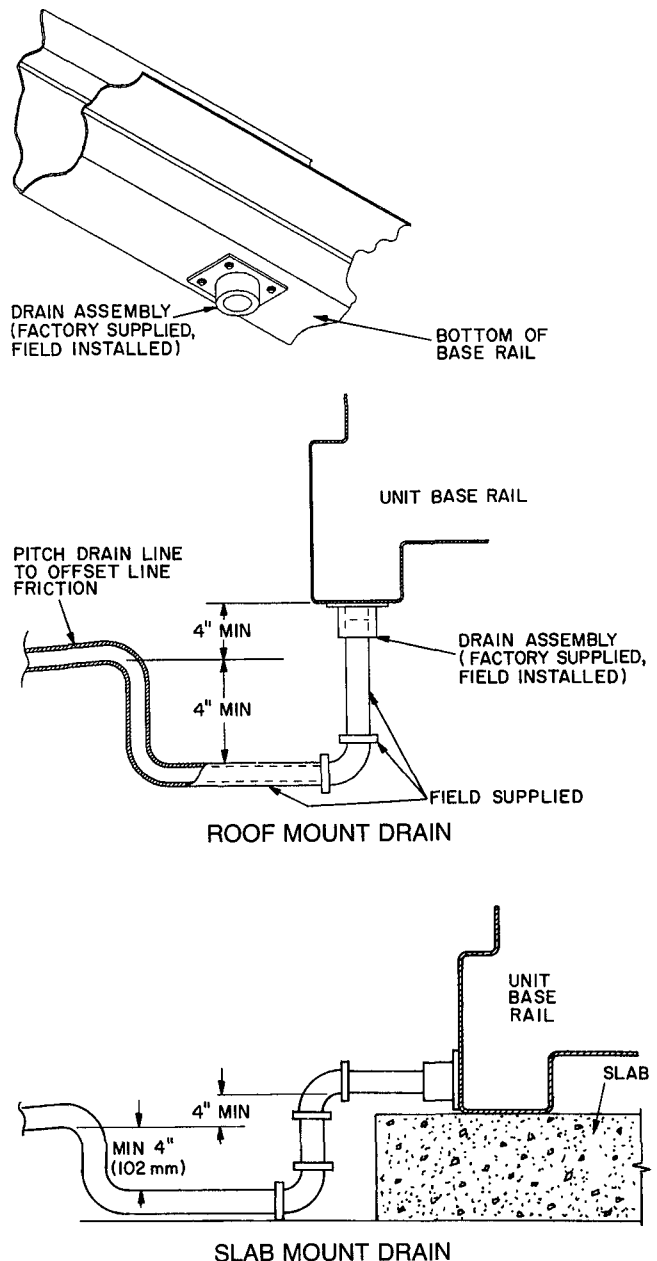



Fig. 4 – Condensate Drain Piping Details



UNIT SIZE	WEIGHT*		A		B		C		D		E		F		G	
	Lb	Kg	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.
48LJD024	2895	1313.0	1813	6-1 <sup>3</sup> / <sub>4</sub>	2182	7-1 <sup>7</sup> / <sub>8</sub>	682	2-2 <sup>7</sup> / <sub>8</sub>	3909	12-9 <sup>7</sup> / <sub>8</sub>	534	1-9	2187	7-2 <sup>7</sup> / <sub>64</sub>	807	2-7 <sup>3</sup> / <sub>4</sub>
48LJE024	2975	1349.4	1813	6-1 <sup>3</sup> / <sub>4</sub>	2182	7-1 <sup>7</sup> / <sub>8</sub>	682	2-2 <sup>7</sup> / <sub>8</sub>	3909	12-9 <sup>7</sup> / <sub>8</sub>	534	1-9	2187	7-2 <sup>7</sup> / <sub>64</sub>	807	2-7 <sup>3</sup> / <sub>4</sub>

\*See note 9.

NOTES:

- Dimensions in [ ] are in millimeters
-  Center of gravity.
- Allow 12'-0" [3658] at top and 6'-0" [1829] on sides for service and operational clearance.
- On multiunit applications allow 12'-0" [3658] between adjacent condensers and economizers.
- For smaller service and operational clearances, contact Carrier Application Engineering Department.
- Vertical discharge ducts are designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on the accessory roof curb.
- Always line up condenser end of unit tight against the roof curb.
- Units with power exhaust require a 90 degree elbow in return air duct.
- Weight of unit includes optional economizer. For unit without economizer, deduct 130 lb (59 Kg).

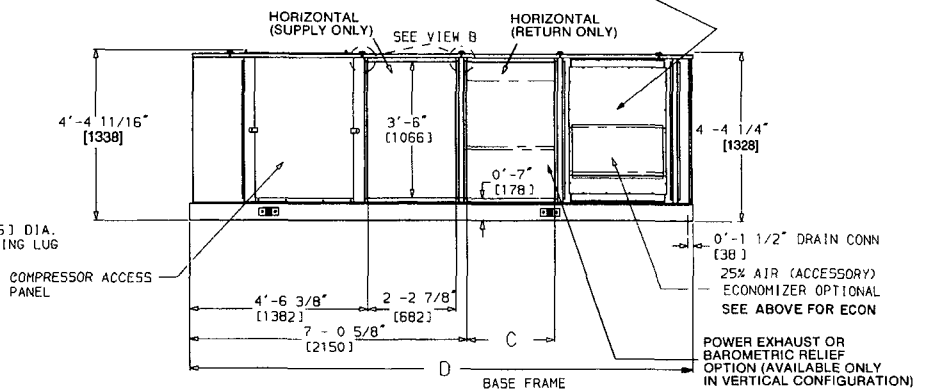
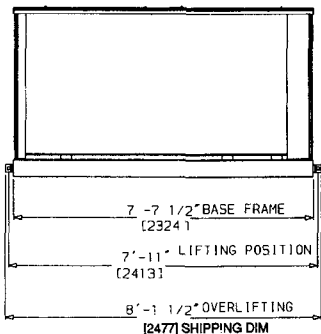
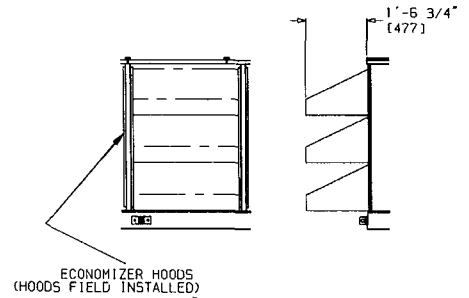
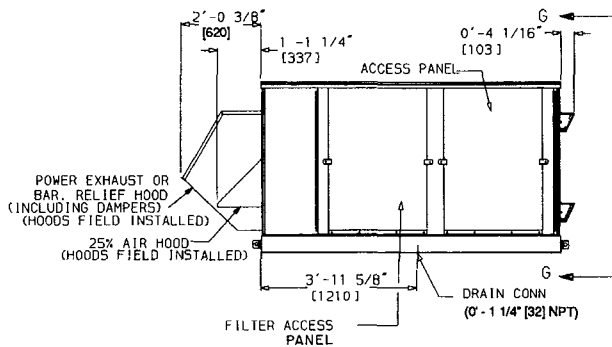
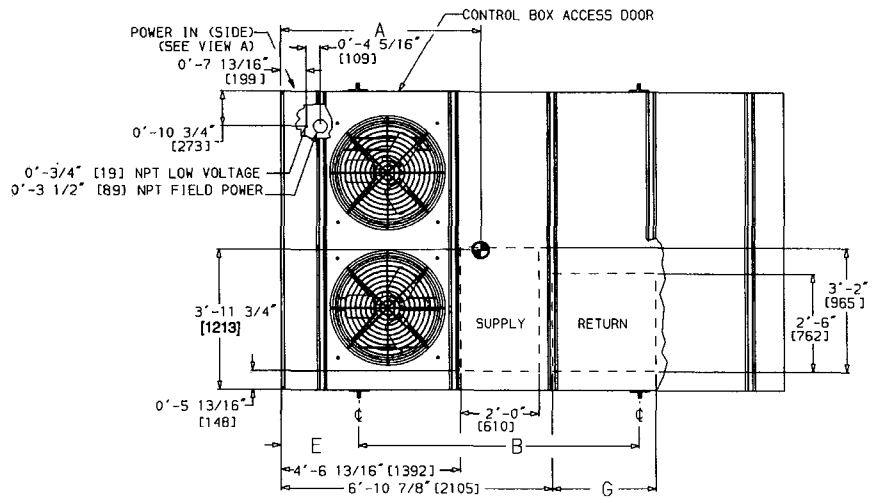
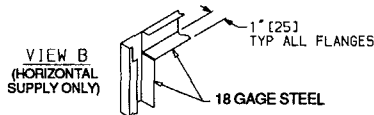
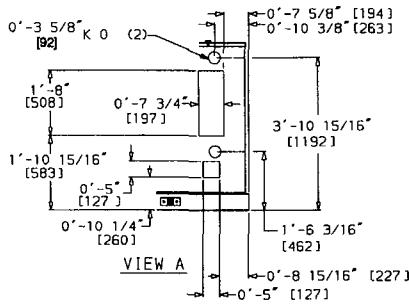
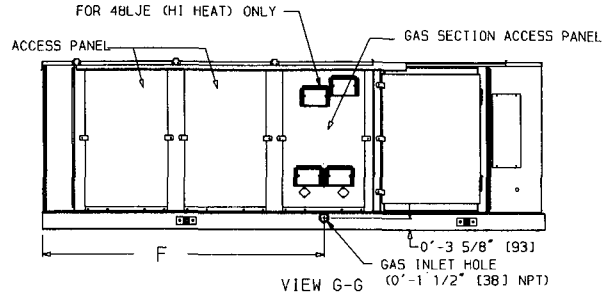



Fig. 5a - Base Unit Dimensions, 48LJ024 Units

UNIT SIZE	WEIGHT*		A		B		C		D		E		F	
	Lb	Kg	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.
50LJ024	2565	1163.5	1556	5-1¼	1680	5-6½	3141	10-3⅛	526	1-8⅛	807	2-7¾	2048	6-8⅞

\*See note 10

NOTES:

- Dimensions in [ ] are in millimeters.
-  Center of gravity.
- Allow 12'-0" [3658] at top and 6'-0" [1829] on sides for service and operational clearance
- On multiunit applications allow 12'-0" [3658] between adjacent condensers and economizers
- For smaller service and operational clearances, contact Carrier Application Engineering Department
- Vertical discharge ducts are designed to be attached to accessory roof curb. If unit is mounted on dunnage, it is recommended the ducts be supported by cross braces as done on the accessory roof curb
- Always line up condenser end of unit tight against the roof curb.
- Units with power exhaust require a 90 degree elbow in return-air duct.
- Units with electric heat require a 90 degree elbow in supply-air duct.
- Weight of unit includes optional economizer. For unit without economizer, deduct 130 lb (59 Kg)

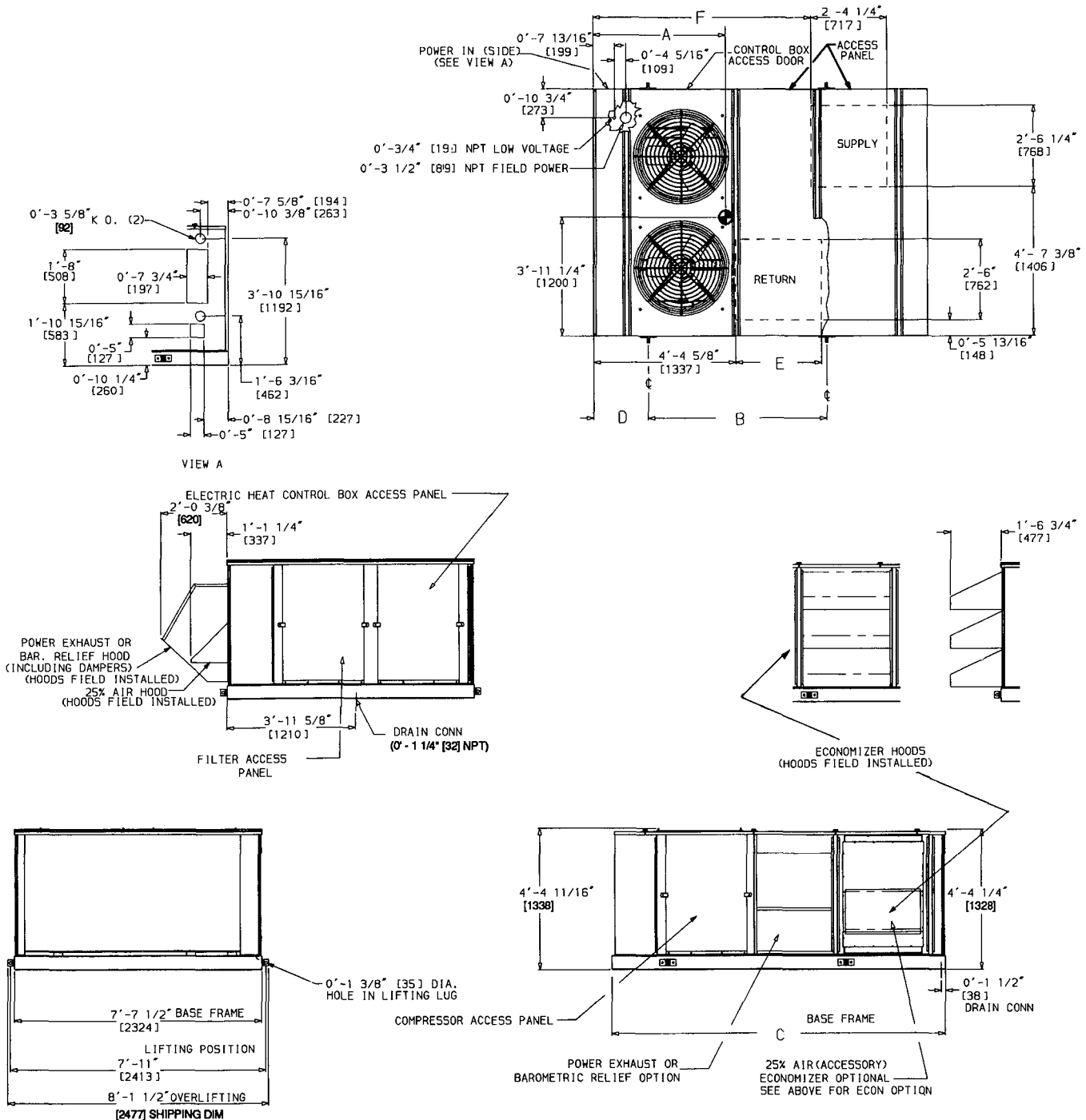



Fig. 5b — Base Unit Dimensions, 50LJ024 Units

UNIT SIZE	WEIGHT*		A		B		C		D		E	
	Lb	Kg	mm	Ft-in	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.	mm	Ft-in.
50LW024	2775	1258.7	1803	5-11	2182	7-17/8	682	2-27/8	3909	12-97/8	534	1-9

\*See note 10

NOTES:

- Dimensions in [ ] are in millimeters.
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- Allow 12'-0" [3658] at top and 6'-0" [1829] on sides for service and operational clearance.
- On multiunit applications allow 12'-0" [3658] between adjacent condensers and economizers.
- For smaller service and operational clearances, contact Carrier Application Engineering Department
- Always line up condenser end of unit tight against the roof curb.
- Weight of unit includes optional economizer. For unit without economizer, deduct 130 lb (59 Kg)

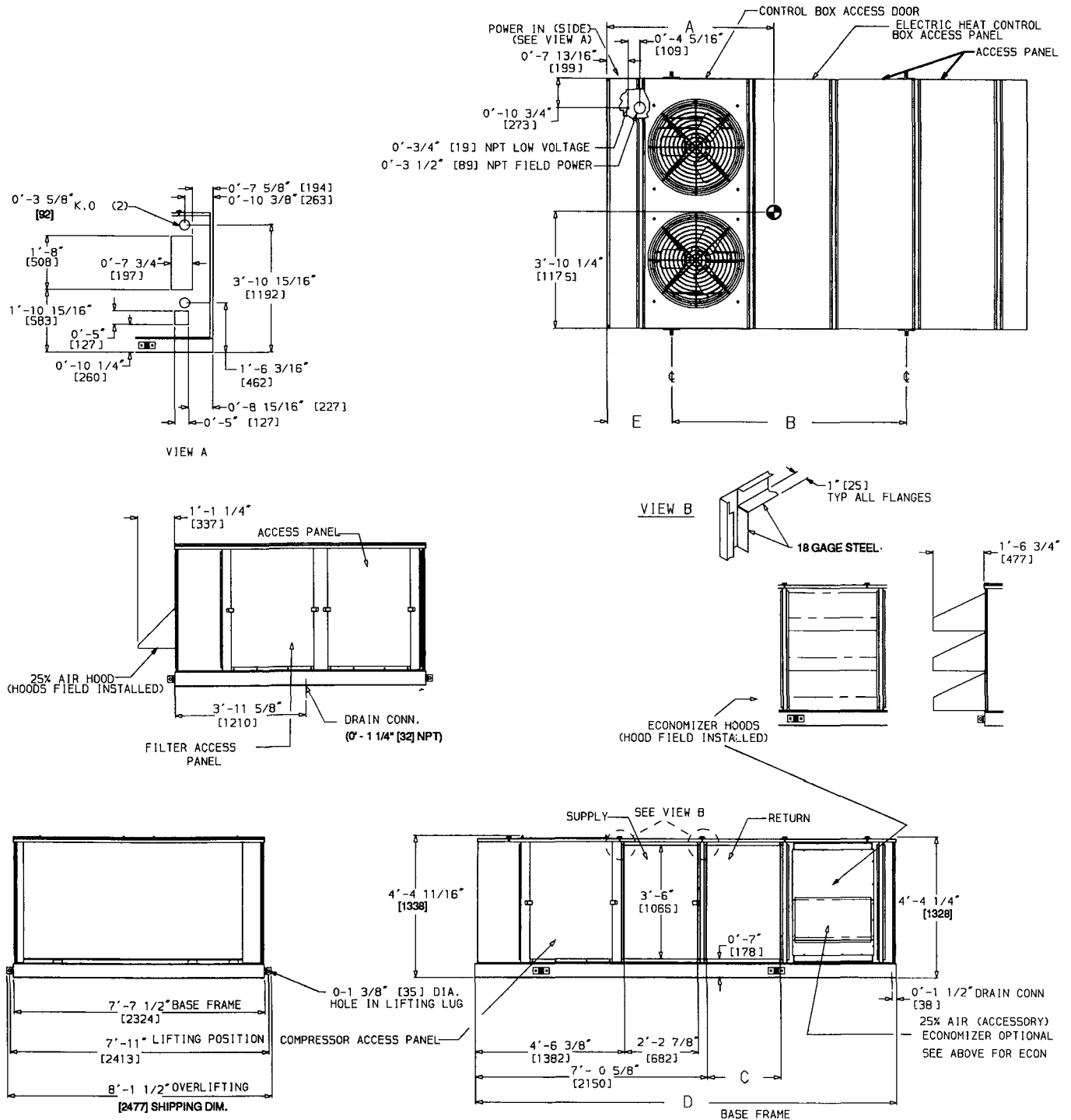


Fig. 5c - Base Unit Dimensions, 50LW024 Units

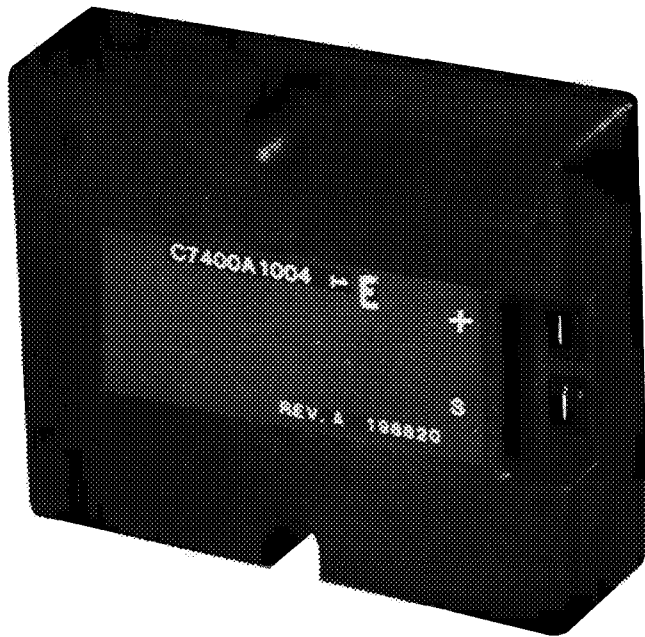


Fig. 6 — Enthalpy Sensor

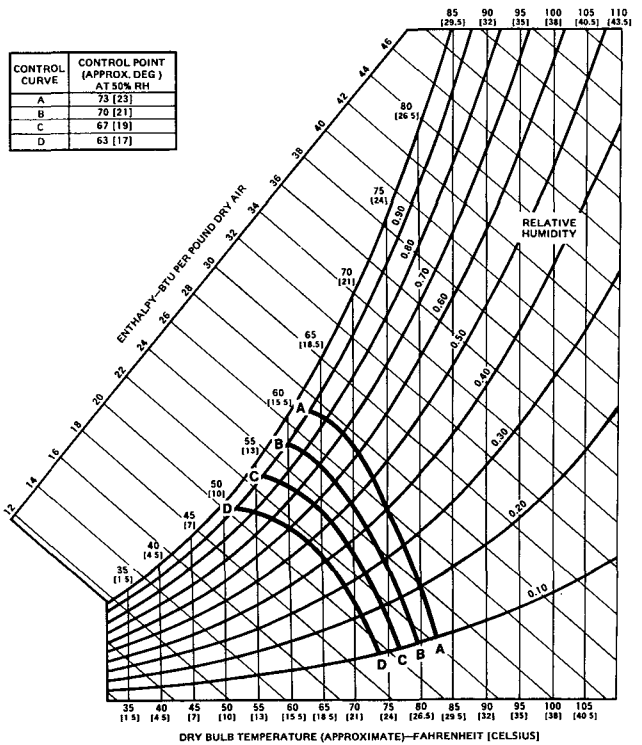


Fig. 9 — Setting "A" Operating Conditions

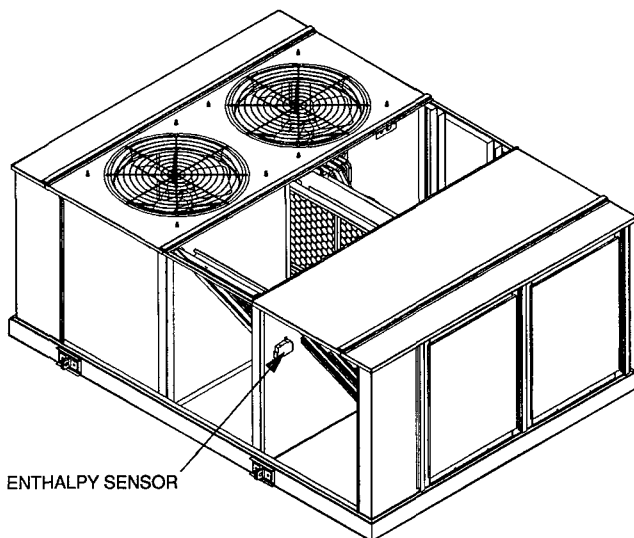


Fig. 7 — Enthalpy Sensor Location

### Install Outdoor-Air Hoods

**ECONOMIZER HOODS** — These hoods are shipped separately from the base unit in a carton. This carton contains:

- 3 preassembled economizer hoods
- 1 filter angle
- 3 filter retainers
- 6 aluminum mesh cleanable filters, 16 in. x 20 in. x 2 in.
- 2 channel panels } See Fig. 10 for cross-section
- 1 channel clip }
- 1 fastener package (taped to a hood)

The fastener package contains:

- 8 capscrew bolts, 1/4—20 x 1/2-in. long
- 8 nuts, 1/4—20
- 18 screws, 1/4 AB x 5/8-in. long
- 8.3 ft of 1/8-in. thick x 1/2-in. wide seal strip with pressure-sensitive adhesive on one side.

1. Remove the lag screws holding the economizer hoods and channel panels to the shipping skid. (There are 4 lag screws per side.)
2. Remove the lag screws holding the filter angle and channel clip to the shipping skid. (There are 2 lag screws per part.)
3. The filters are wrapped to prevent shipping damage. Remove the screws holding the filter retainers to the hoods. (There are 4 screws per retainer.)
4. Remove wrap from filters. Do not reinstall until after the hoods are mounted to the unit.

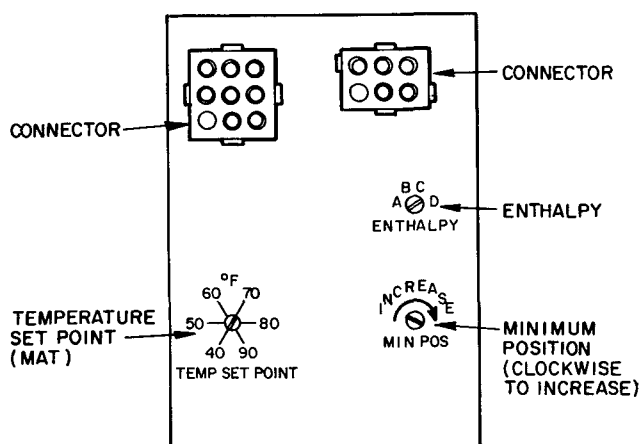
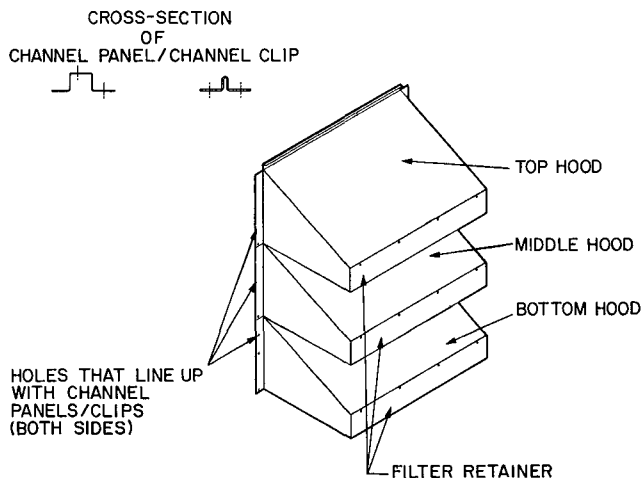


Fig. 8 — Enthalpy Sensor Setting, Mixed Air Thermistor (MAT) and Economizer Minimum Position Adjustments (Top of Economizer Motor)

**IMPORTANT:** If unit is to be equipped with either barometric relief or power exhaust, the barometric relief/power exhaust hood must be installed prior to the installation of the economizer hoods. If installing barometric relief or power exhaust, proceed to the next section (Barometric Relief/Power Exhaust Hood) and install before proceeding any further. Then return to this point.

5. Place the hoods on a flat surface.
6. Insert the top flange of the middle hood flush with the bottom flange of the top hood AND the top flange of the bottom hood flush with the bottom flange of the middle hood. When properly laid out the side flanges of the 3 hoods should form one continuous flange.
7. See Fig. 10 and insert the capscrew bolts through the flange holes as shown, from the back side, threads facing outward. Note that though there are 12 holes (4 per hood) per side, only the 3 shown per side are to be used.
8. If unit is not to be equipped with barometric relief or power exhaust, discard the channel clip. If unit is to be equipped with barometric relief or power exhaust, discard one of the channel panels.
9. Cut 2 pieces of seal strip 43¾ in. long for placement on the channel panels (or one channel panel and one channel clip if barometric relief or power exhaust is used) on the flanges with the holes.
10. Begin one in. from the top of the flange and center the seal strip on the flange, covering the holes.  
NOTE: If seal strip is too high or too low, water leakage may occur. Maintain the one in. dimension for placement.
11. Using a punch or other tool, make holes in the seal strip for screws.
12. Place channel panels on the hood flanges, using the middle 3 holes. If using barometric relief or power exhaust, use the channel clip in place of the previously discarded channel panel, attaching it to the left side of the economizer hoods (left side when facing hoods).
13. Secure channel panels and/or channel clip to the hoods using 6 of the nuts from the fastener package.



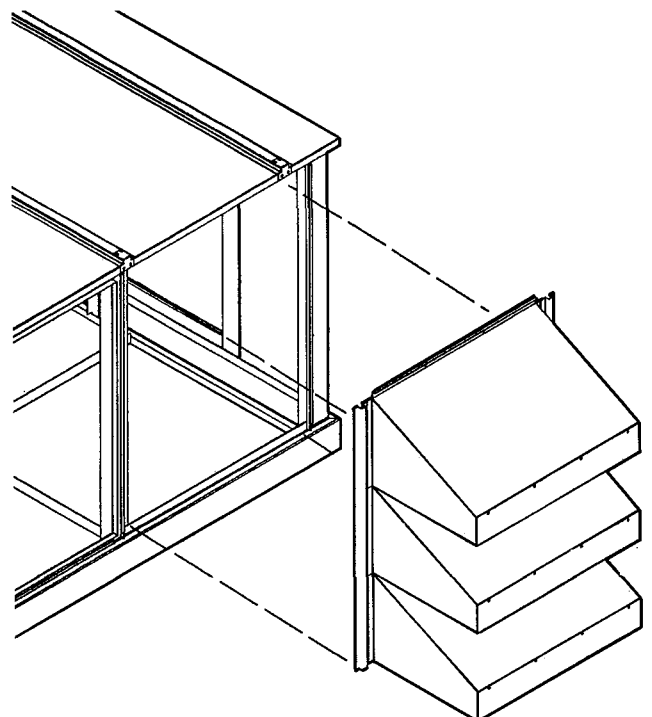
**Fig. 10 – Economizer Hood Assembly Holes**

14. See Fig. 11 and place economizer hood assembly over outdoor-air opening.

**CAUTION**

Economizer hood assembly is heavy. At least 2 men should handle it.

15. Line up the holes in the right channel panel with the holes in the flange of the corner post. On 48/50LJ units, line up the holes on the left channel panel with the holes on the flange of the panel next to the economizer section. On 50LW units, line up the holes on the left channel panel with the holes in the flange of the return duct flange. On units with barometric relief or power exhaust, line up the holes in the channel clip with the holes in the fan deck. (It is necessary to remove the top and bottom screws from the fan deck to install economizer hood assembly.)
16. Once economizer hood assembly is in place, secure it using 10 of the screws from the fastener package (5 per side).
17. Using 2 of the screws from the fastener package, attach the top flange of the economizer hood assembly to the unit top rail. The holes in the top rail are behind the top rail gasket.
18. Using 4 screws from the fastener package, attach top and bottom of the channel panels and/or clips to the top rail and the base rail. Again, the holes in the top rail and the base rail will be covered by gasketing.
19. Attach filter angle to base rail, using 2 screws from fastener package. Since the holes are covered by the base rail gasket, locate and punch them out before attaching the filter angle.
20. Seal any small gaps between flanges and at the top with RTV sealant to prevent water leakage.
21. Reinstall filters and filter retainers.



**Fig. 11 – Economizer Hood Installation**

**BAROMETRIC RELIEF/POWER EXHAUST HOOD** — The same hood is used for barometric relief and power exhaust, and is shipped separately from the base unit, in cartons marked 50DJ900371.

Barometric relief can only be unit mounted on vertical supply/return units (48/50LJ). It may be duct mounted on horizontal supply/return units (50LW).

Power exhaust can only be unit mounted on vertical supply/return units 48/50LJ. Accessory power exhaust may be duct mounted on horizontal supply/return unit 50LW.

**IMPORTANT:** If using power exhaust, the return duct must have a 90 degree elbow below the unit to comply with ANSI codes.

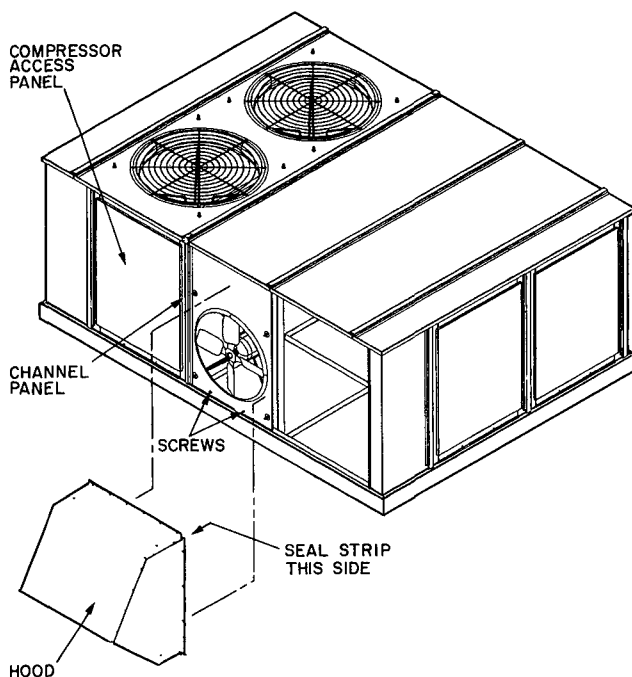
Cartons contain:

- 1 preassembled hood/damper assembly
- 1 fastener package (taped to inside of hood)

The fastener package contains:

- 6 screws, 1/4 AB x 5/8-in. long
- 2 seal strips 36-in. long x 1-in. wide x 1/8-in. thick with pressure-sensitive adhesive on one side.
- 2 seal strips, 33-in. long x 1-in. wide x 1/8-in. thick with pressure-sensitive adhesive on one side.

1. Remove the lag screws holding hood assembly to shipping skid. See Fig. 12.
2. Before installing the hood on the unit, remove the channel panel attached to the barometric relief/power exhaust fan deck and the panel to the left.
3. Remove the middle 2 screws holding the fan deck to the base rail.
4. Apply the 36-in. long seal strips to the side flanges of the hood assembly.
5. Apply the 33-in. long seal strips to the top and bottom flanges of the hood assembly.



**Fig. 12 — Power Exhaust/Barometric Relief Hood (50LJ Unit Shown)**

6. Trim the excess seal strip as needed.
7. Make seal strips flush with the outer edges of the flanges.
8. Use a punch to punch out holes for the screws.

**▲ CAUTION**

Hood assembly is heavy. At least 2 men should handle it.

9. Line up the top flange of the hood assembly with the 6 holes in the fan deck (approximately 6 1/2 in. from the top.)
10. Using the 6 screws from the fastener package, secure the top flange of the hood assembly to the fan deck.
11. Reinstall the 2 screws attaching the fan deck to the base rail. (The holes in the bottom flange of the hood assembly should line up with these holes.)
12. Reinstall the channel panel between the fan deck and the panel to the left. The 3 holes in the left side flange of the hood assembly should line up with the corresponding holes in the fan deck and the channel panel. The 3 holes in the right side flange of the hood assembly should line up with the holes in the fan deck and the holes in the channel clip described in the earlier section, Economizer Hoods. Unit is now ready for installation of economizer hoods.

**Field Wire Routing** — Field wiring can be brought into the unit from the bottom (through basepan and roof curb) or through the side of the unit (corner post next to control box).

A 3 1/2 in. NPT coupling for field power wiring and a 3/4-in. NPT coupling for 24-v control wiring are provided in the basepan. In the side post, there are two 3 5/8 in. knockouts for the field power wiring. If control wiring is to be brought in through the side of unit, a 7/8-in. diameter hole must be drilled in the condenser side post next to the control box.

There are 2 large block-off plates in the corner post. The smaller block-off (5 in. x 5 in.) is used to provide access to main unit control box during installation of power wiring. The larger block-off (7 3/4 in. wide by 20-in. high) is located between the two 3-5/8 in. knockouts and is used when a 400-amp disconnect box is rewired.

If disconnect box is mounted to corner post, be careful not to drill any screws into the condenser coil. The corner post is marked to indicate the area where it is safe to drill holes and install screws.

**ROUTING THROUGH BOTTOM OF UNIT** — If wiring is brought in through bottom of unit, use field-supplied watertight conduit to run power wiring from basepan out through bottom 3 5/8 in. knockout to the disconnect box and back into the main control box. When 200-amp or smaller disconnect is used, the disconnect box should be located so that wiring can be run from back of disconnect box to unit through top 3 5/8 in. knockout. Watertight strain relief (field supplied) must be used in knockout. When 400-amp disconnect is used, remove 7 3/4 in. x 20-in. block-off in corner post and use field-supplied elbow to route conduit through corner post to the control box.

Use strain relief going into control box through 4 1/2 in. diameter hole provided. After wires are in unit control box, connect to power terminal block. See power wiring section on page 15.

Low-voltage wiring must be run in watertight conduit from the basepan to control box and through one-in. diameter-hole provided in upper righthand corner of unit control box. Field-supplied strain relief must be used going into the box. After wiring is in control box, make connections to proper

terminals on terminal blocks. See control wiring section on page 17.

**ROUTING THROUGH SIDE OF UNIT** — When 200-amp or smaller disconnect is used, route power wiring in field-supplied watertight conduit into unit through 3<sup>5</sup>/<sub>8</sub> in. knockout. Strain relief (field supplied) must be used in knockout. When 400-amp disconnect is used, remove 7<sup>3</sup>/<sub>4</sub> in. x 20-in. block-off in corner post and use field-supplied elbow to route conduit through corner post to the control box.

Use field-supplied strain relief going into control box through 4<sup>1</sup>/<sub>2</sub> in. diam hole provided. After wires are in unit control box, connect to power terminal block. See power wiring section below.

Bring low-voltage control wiring through field-drilled 7/8-in. diameter hole in condenser side post. Use strain relief going into one-in. diameter hole in upper righthand corner of unit control box.

After wiring is in control box, make connection to proper terminals on terminal blocks. See control wiring section on page 17.

### Field Electrical Connections

**POWER WIRING (All units)** — Units are factory wired for the voltage shown on the unit nameplate. The main terminal block is suitable for use with aluminum or copper wires.

When installing units, provide a disconnect per NEC (National Electrical Code) of adequate size (MOCP [maximum overcurrent protection] of unit is on the informative plate). All field wiring must comply with NEC and all local codes. Size wire based on MCA (minimum circuit amps) on the unit informative plate. See Fig. 13 for power wiring connections to the unit power, terminal block and equipment ground.

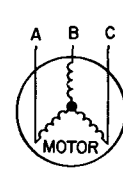
Operating voltage to the compressor must be within the voltage range indicated on the unit nameplate. Voltages between phases must be balanced within 2%, and the current must be balanced within 10%. See Tables 2 and 3 for unit electrical data.

Use the following formula to determine the percent voltage imbalance.

% Voltage Imbalance

$$= 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 460-3-60



AB = 452 v  
BC = 464 v  
AC = 455 v

$$\begin{aligned} \text{Average Voltage} &= \frac{452 + 462 + 455}{3} \\ &= \frac{1371}{3} = 457 \end{aligned}$$

Determine maximum deviation from average voltage:

(AB) 457 - 452 = 5 v  
(BC) 464 - 457 = 7 v  
(AC) 457 - 455 = 2 v

Maximum deviation is 7 v.

Determine percent voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{7}{457} = 1.53\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

**IMPORTANT:** If the supply voltage phase imbalance is more than 2%, contact local utility immediately.

Unit failure as a result of operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

**Table 2 — Electrical Data, 48LJ024**

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA		Total FLA	Hp	FLA	FLA	MCA
208/230-3-60	187	254	38.5	193.0	38.5	193.0	10.8	5.0	15.2	— 6.6/6.0	101.8/112.6	150/150
								7.5	22.0	— 6.6/6.0	108.6/119.4	150/150
460-3-60	414	508	19.3	96.5	19.3	96.5	5.4	5.0	7.2	— 30.0	56.0	70
								7.5	10.5	— 3.0	59.0	70
575-3-60	518	632	14.4	77.2	14.4	77.2	4.8	5.0	5.2	— 2.4	42.4	50
								7.5	8.6	— 2.4	44.8	50
											45.8	60
											48.2	60

**LEGEND**

FLA — Full Load Amps  
Hp — Nominal Horsepower  
IFM — Indoor (Evaporator) Fan Motor  
LRA — Locked Rotor Amps

MCA — Minimum Circuit Amps (for wire sizing)  
MOCP — Maximum Overcurrent Protection  
OFM — Outdoor (Condenser) Fan Motor  
RLA — Rated Load Amps



**Table 3 – Electrical Data, 50LJ,LW024**

NOMINAL V-PH-HZ	VOLTAGE RANGE		COMPR NO. 1		COMPR NO. 2		OFM	IFM		POWER EXHAUST FAN MOTOR	ELECTRIC HEAT		POWER SUPPLY	
	Min	Max	RLA	LRA	RLA	LRA	Total FLA	Hp	FLA	FLA	KW	FLA	MCA	MOCP Fuse Only
208/230-3-60	187	254	38.5	193	38.5	193	10.8	5.0	15.2	—	—	—	112.6/112.6	150/150
										6.6/6.0	—	—	119.2/118.6	150/150
										—	16/18	40.9/ 45.2	112.6/112.6	150/150
										6.6/6.0	16/18	40.9/ 45.2	119.2/118.6	150/150
										—	33/36	81.8/ 90.4	121.3/132.0	150/150
										6.6/6.0	33/36	81.8/ 90.4	121.3/132.0	150/150
	187	254	38.5	193	38.5	193	10.8	7.5	22.0	—	—	—	119.4/119.4	150/150
										6.6/6.0	—	—	126.0/125.4	150/150
										—	16/18	40.9/ 45.2	119.4/119.4	150/150
										6.6/6.0	16/18	40.9/ 45.2	126.0/125.4	150/150
										—	33/36	81.8/ 90.4	129.8/140.5	150/175
										6.6/6.0	33/36	81.8/ 90.4	129.8/140.5	150/175
460-3-60	414	508	19.3	96.5	19.3	96.5	5.4	5.0	7.2	—	—	—	56.0	70
										3.0	—	—	56.0	70
										—	18	22.6	56.0	70
										3.0	18	22.6	59.0	70
										—	36	45.2	65.5	70
										3.0	36	45.2	65.5	70
	414	508	19.3	96.5	19.3	96.5	5.4	7.5	10.5	—	—	—	59.3	70
										—	—	—	62.3	80
										3.0	18	22.6	62.3	70
										—	18	22.6	62.3	80
										3.0	36	45.2	69.6	80
										—	36	45.2	69.6	80
575-2-60	518	632	14.4	77.2	14.4	77.2	4.8	5.0	5.6	—	—	—	42.8	50
										2.4	—	—	45.2	50
										—	36	36.1	52.1	50
										2.4	36	36.1	52.1	50
										—	72*	72.3	97.4	125
										2.4	72*	72.3	97.4	125
	518	632	14.4	77.2	14.4	77.2	4.8	7.5	8.6	—	—	—	45.8	60
										—	—	—	48.2	60
										2.4	36	36.1	55.9	70
										—	36	36.1	55.9	70
										2.4	72*	72.3	101.1	125
										—	72*	72.3	101.1	125
518	632	14.4	77.2	14.4	77.2	4.8	7.5	8.6	—	—	—	123.8	125	
									—	—	—	123.8	125	
									2.4	36	36.1	101.1	125	
									—	36	36.1	101.1	125	
									2.4	72*	72.3	123.8	125	
									—	72*	72.3	123.8	125	

\*LJ units only  
†LW units only

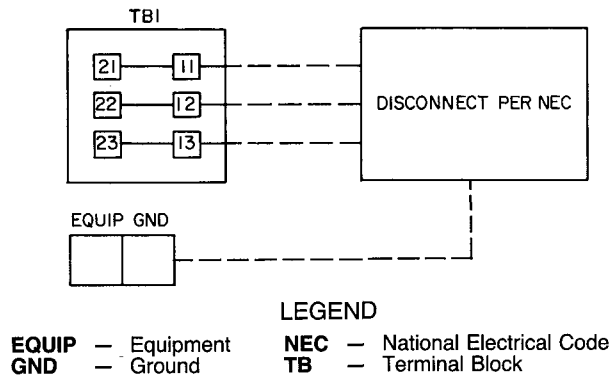
**LEGEND**

**FLA** — Full Load Amps  
**Hp** — Nominal Horsepower  
**IFM** — Indoor (Evaporator) Fan Motor  
**LRA** — Locked Rotor Amps

**MCA** — Minimum Circuit Amps (for wire sizing)  
**MOCP** — Maximum Overcurrent Protection  
**OFM** — Outdoor (Condenser) Fan Motor  
**RLA** — Rated Load Amps







**Fig. 13 — Field Power Wiring Connections**

**CONTROL WIRING** — Install a Carrier-approved accessory thermostat assembly according to the installation instructions shipped with the accessory. Locate thermostat assembly on a solid wall in the conditioned space to sense average temperature (where airflow is stable and thermostat is not in direct line of supply-air duct). Route thermostat cable or equivalent leads of no. 18 AWG (American Wire Gage) colored wire from subbase terminals to 24-v terminal strip (P1). The terminal strip is located on the constant volume control board on units with no economizer and on the economizer board on units with the economizer option (see Fig. 14).

The total wire length between the unit and the thermostat and the return wire from the thermostat to the unit should not exceed the following limits: 50 ft of 18 AWG, 80 ft of 16 AWG or 125 ft of 14 AWG. See Fig. 15 for field wiring connections between the thermostat and the unit 24-v terminal block.

There are no required 115-v field wiring connections, therefore, no provisions have been made in the unit for running 115-v wiring. If any of the field-installed options requiring 115-v connections are desired, the unit must be modified in the field for 115-v wiring.

Options requiring 24-v or 115-v control wiring are listed below.

**Building Pressurization or Smoke Purge Mode** — Refer to Building Pressurization Mode section and Smoke Purge Mode section on page 24 for additional information. See Fig. 16 and unit wiring label for wiring details.

#### 24-V Connections:

1. Firestat or smoke detector (field-supplied switch 1). Remove factory-installed jumper wire and wire a field-supplied firestat or smoke detector between terminals 2 and 3 on terminal block 2 (TB2) in the unit control box (see Fig. 14 for the location of TB2 in the control box).
2. Switch to supply 24-v power to the economizer motor during building pressurization or smoke purge (field-supplied switch 5). Wire a normally-open switch between terminal 3 on TB2 and terminal T1 in the economizer motor.
3. Switch to open economizer outdoor air damper during building pressurization or smoke purge (field-supplied switch 6). Wire a field-supplied switch between terminals 8 and 9 on the economizer motor (in the top of economizer motor). When this switch is manually opened, it will drive the outside air damper fully open.

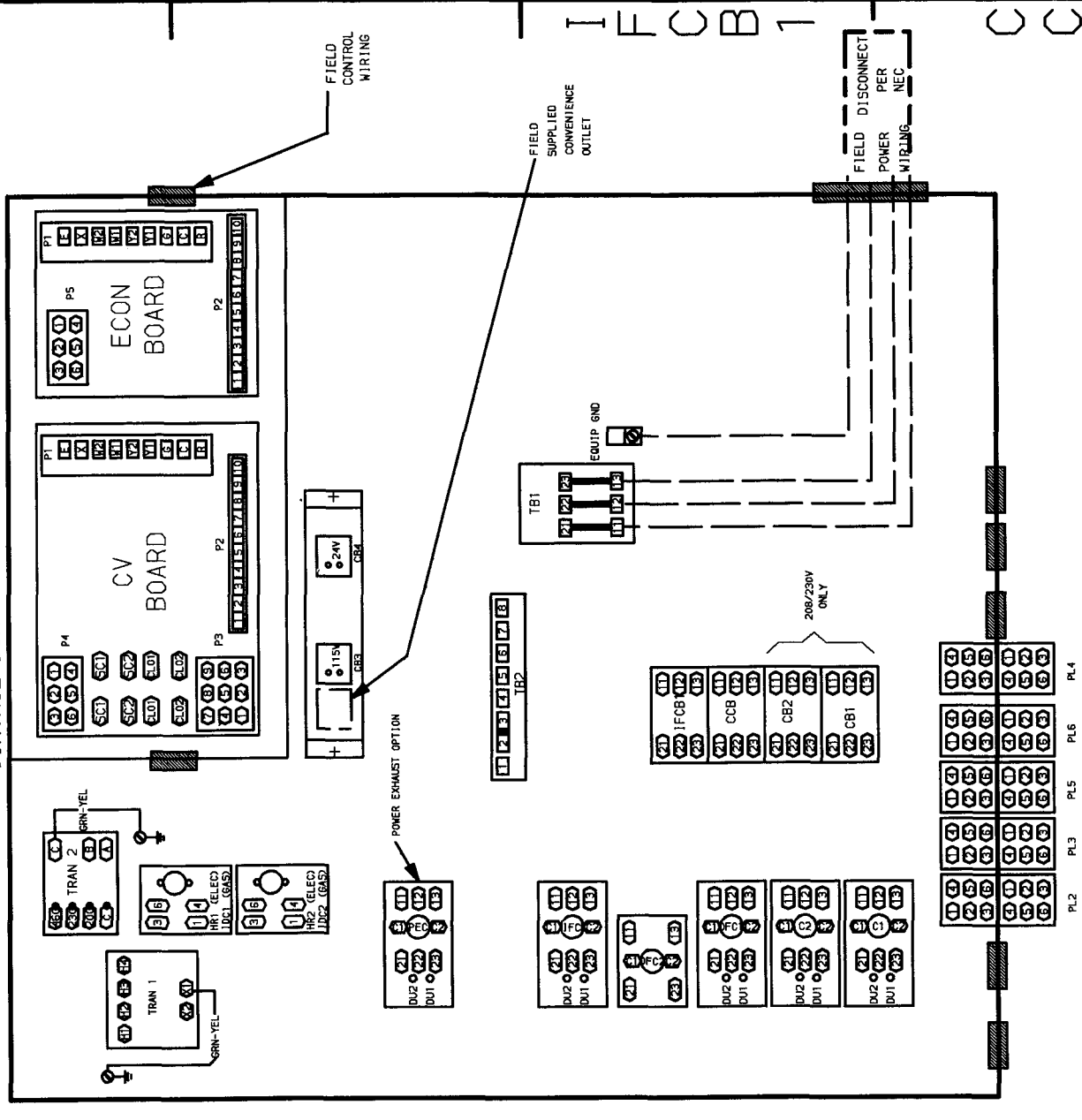
#### 115-V Connections:

1. Building pressurization switch (field-supplied switch 2). — Wire a field-supplied switch between terminal 4 on TB2 and the C1 connection on the evaporator-fan contactor coil (IFC1 on unit label diagram).
2. Smoke purge switch (field-supplied switch 4). — Wire a field-supplied switch between terminal 4 on TB2 (in the unit control box) and the C1 connection on the power exhaust contactor coil (PEC1 on unit label diagram).
3. Switch to isolate evaporator-fan motor from power exhaust motor during building pressurization or smoke purge (field-supplied switch 3). — Wire a field-supplied switch in series with the wire from the C1 connection on the IFC1 to the red wire on the economizer damper motor end switch (EDMS on unit label diagram).

#### Convenience Outlet

**115-V Connection:** Convenience outlet can be mounted on panel containing control circuit breakers CB3 and 4. (See Fig. 14.) Remove sheet metal cover that conceals  $2\frac{3}{8}$  by  $1\frac{7}{16}$  in. hole and install outlet in hole. Wire between terminals 4 and 5 on TB2 in the unit control box (see Fig. 17). The convenience outlet should be ground fault protected. Convenience outlet is to be used only when the unit is not operating.

COMPONENT ARRANGEMENT  
CONTROL BOX



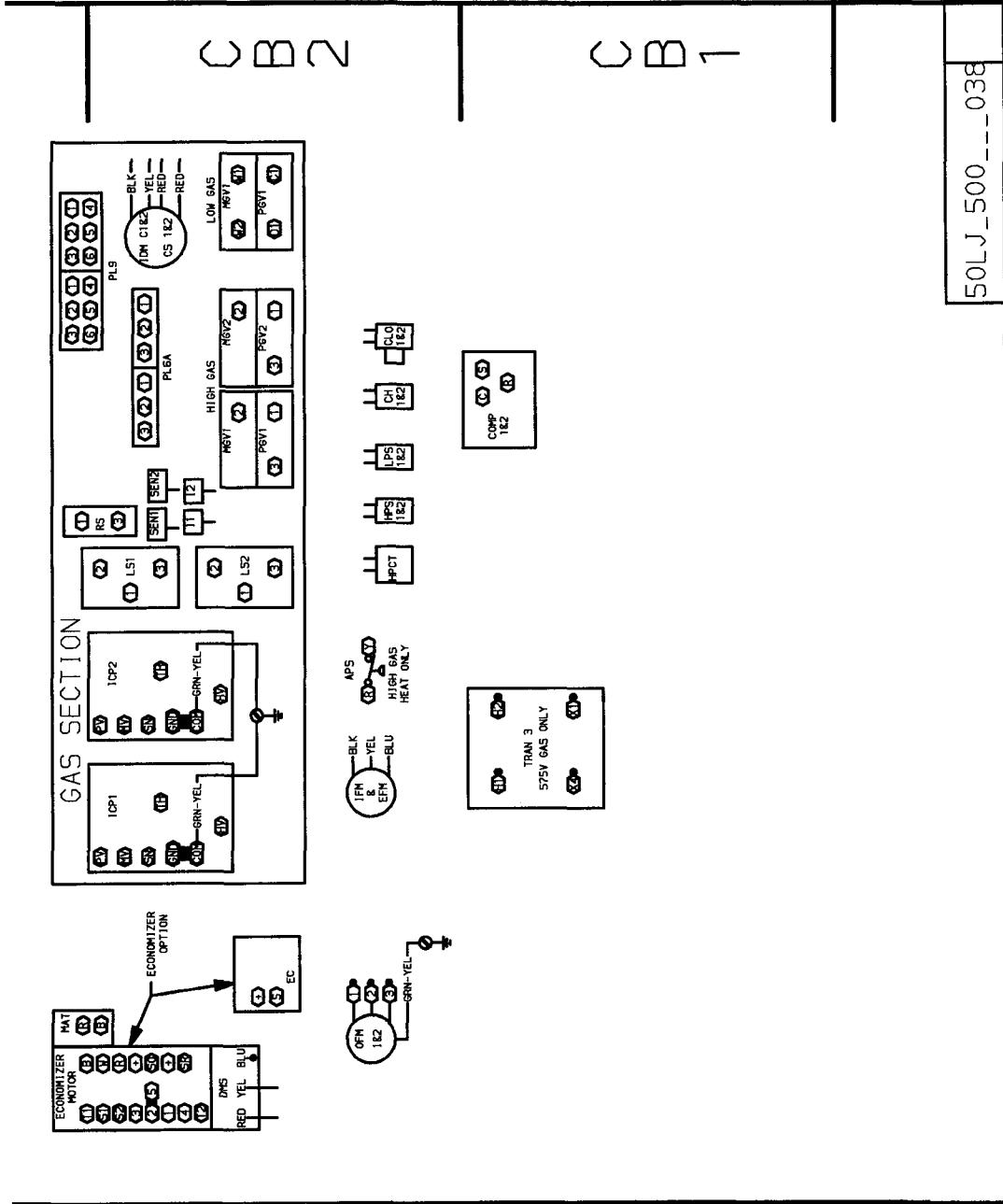


Fig. 14 – Control Box Component Arrangement, 48/50LJ and 50LW Units

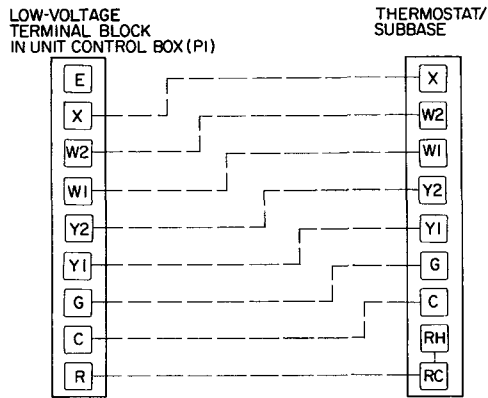
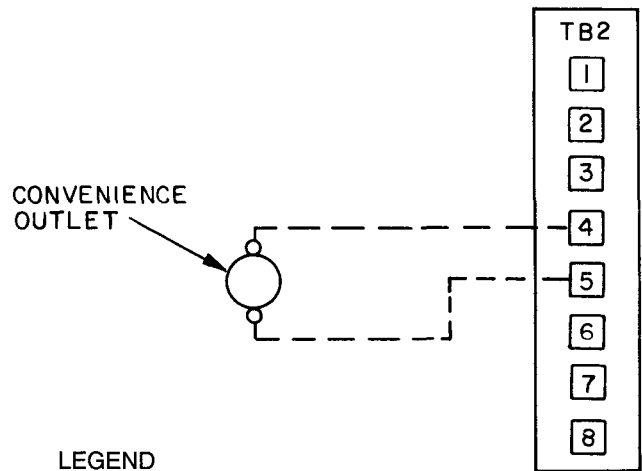


Fig. 15 - Field Control Thermostat Wiring



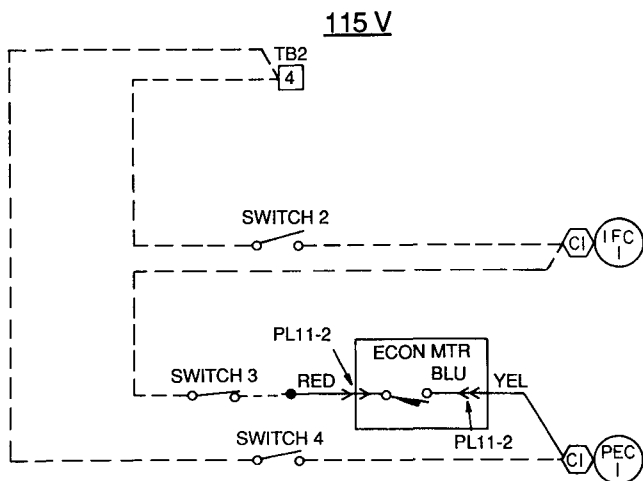
LEGEND

TB - Terminal Block

NOTES:

- 1 Convenience outlet is field supplied and installed. Ground fault outlet should be used.
- 2 - - - - is field wiring.

Fig. 17 - 115-V Field Wiring



LEGEND

- |      |                                     |     |                           |
|------|-------------------------------------|-----|---------------------------|
| C    | - Contactor                         | MTR | - Motor                   |
| ECON | - Economizer                        | PEC | - Power Exhaust Contactor |
| IFC  | - Indoor (Evaporator) Fan Contactor | PL  | - Plug                    |
|      |                                     | TB  | - Terminal Block          |

- Switch 1 - Firestat or smoke detector - normally closed.  
 Switch 2 - Building pressurization switch (energize evaporator-fan motor) - normally open.  
 Switch 3 - Switch to isolate evaporator-fan motor from power exhaust motor - normally closed  
 Switch 4 - Switch purge switch (energizer power exhaust motor) - normally open.  
 Switch 5 - Switch to provide 24 v to economizer motor - normally open.  
 Switch 6 - Switch to drive economizer outdoor-air damper full open - normally closed.

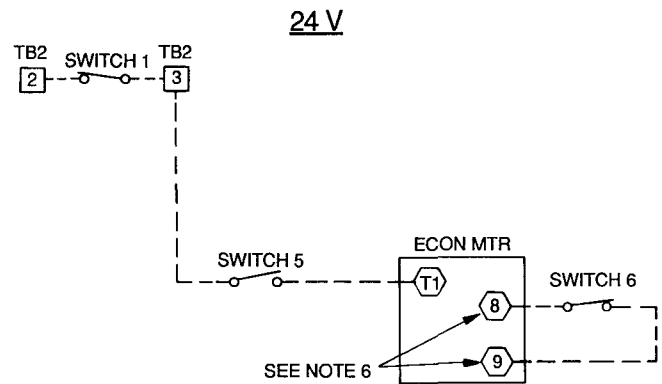
BUILDING PRESSURIZATION

- Switch 1
- Switch 2
- Switch 3 (if unit equipped with power exhaust)
- Switch 5
- Switch 6

SMOKE PURGE

- Switch 1
- Switch 3
- Switch 4
- Switch 5
- Switch 6

Fig. 16 - Field Wiring for Building Pressurization and Smoke Purge



NOTES:

1. Power exhaust option available *only* on vertical supply/return units.
2. In order to install Switch 1, field must remove factory jumper between terminals 2 and 3 on terminal block 2
3. - - - - field wiring.
4. \_\_\_\_\_ factory wiring.
5. All switches are field supplied.
6. Terminals 8 and 9 can be located by removing the top of the economizer motor. Turn over top of motor to access the electronic board and spade terminals.

**Gas Piping** — Unit is equipped for use with natural gas only. Installation must conform to local building codes, or in the absence of local codes, with the NFPA (National Fuel Gas Code), ANSI (American National Standards Institute) Z223.1-1984.

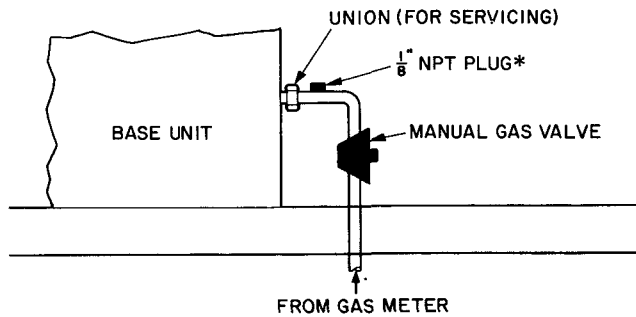
A 1/8 in. NPT tapping plug, accessible for test gage connection, must be field installed immediately upstream of gas supply connection to unit. See Fig. 18.

Natural gas pressure at unit gas connection must not be less than 5 in. wg or greater than 14 in. wg.

Size gas supply piping for 0.5 in. wg maximum pressure drop. Do not use supply pipe smaller than unit gas connection.

**CAUTION**

Disconnect gas piping from unit when leak testing at pressures greater than 0.5 psig. Pressures greater than 0.5 psig will cause gas valve damage resulting in a hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced.



\*NPT plug is field supplied.  
NOTE: Follow all local codes.

**Fig. 18 — Gas Piping Details**

**Installing Flue/Inlet Hoods** — The flue/inlet hoods are shipped in a bag taped to the basepan under the unit fan. Remove the shipping block-offs and install hoods as shown in Fig. 5a and 19. Use RTV sealant to provide rain-proof seal between hoods and door.

**START-UP**

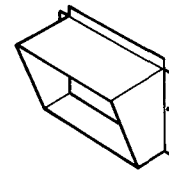
**Unit Preparation** — Check to see that unit has been installed in accordance with these Installation Instructions and all applicable codes.

**Internal Wiring** — Check all electrical connections in the unit control box; tighten as required.

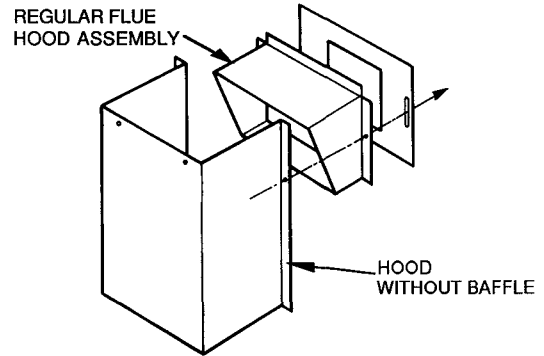
**Refrigerant Service Ports** — Each unit system has 3 Schrader-type service ports, one on the suction line, one on the liquid line, and one on the compressor discharge line. Be sure that caps on the ports are tight.

**Crankcase Heaters** — The crankcase heaters must be firmly locked onto the compressors. The crankcase heaters are energized when there is power to the unit. *Crankcase heaters must be energized for at least 24 hours prior to unit start-up in order to remove liquid refrigerant from the compressor crankcase.*

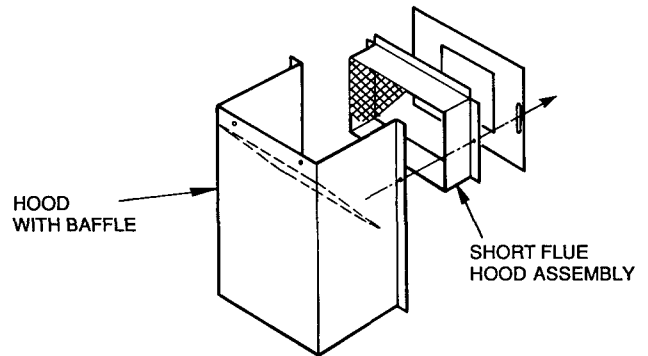
**Compressor Oil** — All units are factory charged with oil. The initial charge is 128 oz. The recharge is 124 oz. See Carrier Standard Service Techniques, Refrigerants, for procedures to add or remove oil.



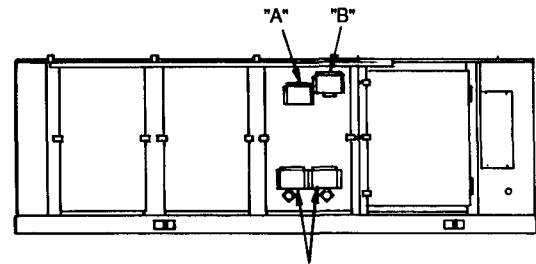
(1) REGULAR INLET HOOD



(2) HOOD WITHOUT BAFFLE (LOW HEAT ONLY)



(3) HOOD WITH BAFFLE (HIGH HEAT ONLY)



INSTALL REGULAR INLET HOODS (1)

**Installation Locations for Flue Hood Assemblies**

UNIT TYPE	LOCATION	
	"A"	"B"
High Heat	Hood With Baffle (3)	Hood With Baffle (3)
Low Heat	—	Hood Without Baffle (2)

NOTE: Numbers in ( ) refer to type of hood to install in location indicated.

**Fig. 19 — Flue Hood Details**

If it is necessary to remove oil, do not remove any oil until the compressor crankcase heater has been ON for at least 24 hours. When additional oil or a complete charge is needed, use only Carrier-approved compressor oil.

**Approved oils:**

- Witco Co. . . . . Suniso 3GS
- Texaco, Inc. . . . . Capella WF-32

Do not use drained oil and do not use any oil that has been exposed to the atmosphere.

**Unit Voltage** — Be sure power source agrees with the unit nameplate rating.

**Leak Test and Dehydration** — Be sure there are no refrigerant leaks. All units are shipped with a complete operating charge of R-22 (Table 1) and should be under sufficient pressure for leak testing after installation. If there is no system pressure, add refrigerant until a pressure is observed and then check for leaks. After leaks are repaired, dehydrate the system. For leak testing and dehydration procedures, see Carrier Standard Service Techniques, Refrigerants, Sections 6 and 7. Do not use the system compressors to evacuate the system.

**Evaporator Fan, Belt, and Sheaves** — Belts, pulleys, and sheaves are factory installed. All pulleys are nonadjustable. See Table 1.

See Table 4 for complete listing of factory and field-supplied pulley and belt combinations. See Table 5 for air quantity limits.

Check the lubrication of fan and motor bearings. Bearings are shipped full of grease for corrosion protection and may run warm temporarily on start-up until the excess grease has discharged. Check bearing setscrews for tightness. Also check the tightness of the setscrews on the fan wheel and on the fan and motor sheaves. Check fan shaft bearing mounts for tightness.

Recheck sheave alignment and belt tension. See Adjustments section on page 26 for instructions.

Hand-turn the fan to make sure the fan wheel does not rub on the fan housing. The fan shaft and motor shaft must be freewheeling before power is applied to the unit.

Following the necessary electrical checks, check for fan vibration. If excessive vibration occurs, check:

- drive misalignment
- sheaves eccentric or out of balance
- wheel out of balance (replace if necessary)

Check rotation of wheel with arrow on the fan housing. Check fan speed with a strobe-type tachometer, or use this formula:

$$\text{Fan Rpm} = \frac{\text{motor rpm} \times \text{motor sheave pitch diameter (in.)}}{\text{fan sheave pitch diameter (in.)}}$$

(Obtain motor rpm from the fan motor nameplate and read sheave pitch diameters marked on the fan and motor sheaves.)

Example:

- Nameplate motor rpm . . . . . 1750
- Motor sheave pitch diameter (in.) . . . . . 6.4
- Fan sheave pitch diameter (in.) . . . . . 12.4

$$\text{Fan Rpm} = \frac{1750 \times 6.4}{12.4} = 903 \text{ rpm}$$

The maximum allowable rpm is 1200. Excessive fan speed may result in condensate carryover from the evaporator coil, fan motor overload, or wheel failure. See Table 5 for Air Quantity Limits.

**Table 5 — Air Quantity Limits**

UNIT	MINIMUM	MAXIMUM
48LJD	6,000	10,000
48LJE	6,162*	10,000
50LJ,LW	6,000	10,000

\*Minimum cfm for heating operation.

**Condenser Fans and Motors** — Each unit has 2 condenser fans and motors; these are factory set. See Fig. 20 for correct location of fan in orifice. Check that fan propeller rotation is correct; it should be counter-clockwise when facing the fans.

**Return-Air Filters** — Check that the correct filters are installed in the filter rack. See Table 1 for quantities and sizes. Access is through the door marked FILTER SECTION. Do not operate the unit without return-air filters.

**Economizer Inlet Screens** — Check that they are in place before operating the unit.

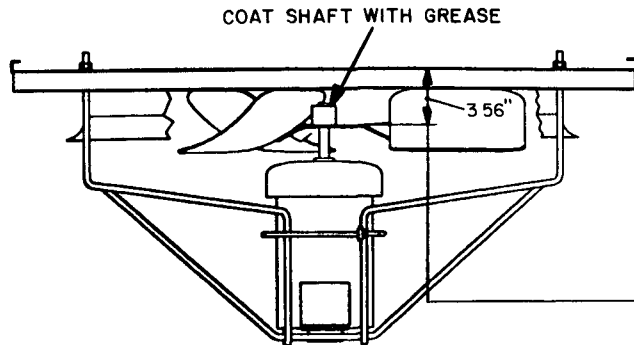
**Table 4 — Evaporator-Fan Pulley Data**

UNIT	FAN RPM	MOTOR PULLEY	BLOWER PULLEY	BELT
		No. Grooves — Type — In.	No. Grooves — Type — In.	No. — Type — Size
48LJ	780*	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3V — 850
	875	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3V — 850
	900*	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3V — 800
	980	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3V — 800
	1090	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3V — 800
	1160	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3V — 800
50LJ	780*	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3V — 560
	875	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3V — 560
	900*	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3V — 500
	980	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3V — 500
	1090	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3V — 500
	1160	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3V — 500
50LW	780*	2 — 3V — 4.75	2 — 3V — 10.6	2 — 3V — 850
	875	2 — 3V — 5.30	2 — 3V — 10.6	2 — 3V — 850
	900*	2 — 3V — 4.12	2 — 3V — 8.0	2 — 3V — 800
	980	2 — 3V — 4.50	2 — 3V — 8.0	2 — 3V — 800
	1090	3 — 3V — 5.00	3 — 3V — 8.0	3 — 3V — 800
	1160	3 — 3V — 5.30	3 — 3V — 8.0	3 — 3V — 800

\*Indicates standard or optional pulley combinations available as shown in Tables 1a and 1b. All other combinations are field supplied.

NOTE: The minimum speed with high electric heat option is 780 rpm

**Economizer Dampers and Potentiometer Settings** — With no power to the unit, the economizer outdoor-air dampers should be fully closed. Check by opening the access door marked FILTER SECTION. On units with economizer, be sure MAT and economizer minimum positions are set at the desired settings. Be sure hood is installed properly.



**Fig. 20 — Condenser-Fan Adjustment**

## Operating Sequences

**COOLING, UNITS WITHOUT ECONOMIZER** — Set unit power to ON position. Set system selector switch at COOL or AUTO. position, and fan switch at AUTO. position. Set thermostat at setting below room temperature.

Y1 on the thermostat closes, energizing Compressor no. 1 as first stage of cooling. (Compressor no. 1 is closest to the condenser coil.) The evaporator fan starts at the same time as Compressor no. 1. If cooling load cannot be satisfied with only first-stage cooling, Y2 on the thermostat will close, energizing Compressor no. 2.

Condenser fans are energized with Compressor no. 1. The no. 1 fan runs continuously while the unit is on mechanical cooling; the no. 2 fan is cycled on and off for head pressure control. Check cooling effects at a setting above room temperature. Compressors will shut off.

## HEATING, UNITS WITHOUT ECONOMIZER

**48LJD (Low Heat)** — Purge gas supply line of air by opening union just ahead of the unit gas valve. When odor of gas is detected, retighten union and wait 5 minutes before proceeding.

Set unit power to ON position. Open manual gas valve supplying gas to unit. Set thermostat system switch at HEAT or AUTO. position, and set fan switch at AUTO. position.

First-stage thermostat (W1) calls for heat. Induced-draft contactor closes and induced-draft and evaporator-fan motors start.

Centrifugal switch closes. Induced-draft motor operates for 30 seconds to purge combustion tubes. Pilot valve opens, allowing gas to flow to first-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame, energizes main gas valve coil and main gas valve opens. Gas flows to main burners, and first-stage burners ignite. Spark ignitor shuts off and pilot remains on.

The sparker will continue to spark for 90 seconds, or until pilot flame is sensed. If the pilot fails to ignite or the sensor fails to detect flame, the pilot valve closes, and the spark ignitor shuts off for 330 seconds (5½ minutes). During this time, the induced-draft motor remains on to purge any unburned gas from the combustion tubes. This ignition sequence will continue indefinitely.

On low-heat units 48LJD, when additional heat is needed, W2 is energized and a second coil in the main gas valve is energized. This brings on an additional stage of heat. When second-stage thermostat is satisfied, the second-stage gas valve coil is deenergized.

When the first-stage thermostat is satisfied, first-stage main gas valve and the pilot valve close. Induced-draft motor shuts off. Evaporator fan motor stops.

**48LJE (High Heat)** — Purge gas supply line of air by opening union just ahead of the unit gas valve. When odor of gas is detected, retighten union and wait 5 minutes before proceeding.

Set unit power to ON position and open manual gas valve, supplying gas to unit. Set thermostat system switch at HEAT or AUTO. position, and set fan switch at AUTO. position.

First-stage thermostat (W1) calls for heat and evaporator fan starts.

When evaporator fan starts, airflow switch closes, closing induced draft contactor, and induced draft motor starts.

Centrifugal switch closes. The induced-draft motor operates for 30 seconds to purge combustion tubes. Pilot valve opens, allowing gas to flow to first-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame, energizes main gas valve coil, and main gas valve opens. Gas flows to main burners and first-stage burners ignite. Spark ignitor shuts off and pilot remains on.

The sparker will continue to spark for 90 seconds, or until pilot flame is sensed. If the pilot fails to ignite, or the sensor fails to detect flame, the pilot valve closes, and the spark ignitor shuts off for 330 seconds (5½ minutes). During this time, the induced-draft motor remains on to purge any unburned gas from the combustion tubes. This ignition sequence will repeat indefinitely.

When additional heat is needed, W2 is energized after a 30-second delay. Pilot valve no. 2 opens, allowing gas to flow to second-stage pilot. Spark ignitor ignites pilot flame. Sensor detects flame, energizes main gas valve coil, and main gas valve no. 2 opens. Gas flows to main burners and second-stage burners ignite. Second-stage spark ignitor shuts off. The induced-draft motor operates for 30 seconds to purge combustion tubes. When the second-stage thermostat is satisfied, W2 is deenergized and the second gas valve is shut off.

When the first-stage thermostat is satisfied, first-stage main gas valve and the pilot valve close. Induced draft motors and evaporator-fan motor shut off.

**50LJ (With Optional Electric Heat)** — Set unit power at ON position. Set system selector switch at HEAT position, and set fan switch at AUTO. position. Set thermostat at setting above room temperature.

When W1 on the thermostat closes, the first stage of electric heat is energized. On a further drop in room temperature, W2 on the thermostat closes, energizing the second stage of electric heat.

**NOTE:** Units equipped with low electric heat option have only one stage. Reset thermostat to a setting below room temperature. Unit should shut off.

**COOLING, UNITS WITH ECONOMIZER** — With sub-base switch set at COOL and fan switch set at AUTO., evaporator fan is energized when Y1 on thermostat closes. If enthalpy is below setting on enthalpy switch, the economizer outdoor-air dampers will modulate open to satisfy the cooling requirement. (Evaporator-fan motor heat should be considered when evaluating the use of outdoor air to satisfy

cooling requirements.) If outdoor air alone will not meet the cooling requirements, Y2 on the thermostat will close, energizing Compressor no. 1 to work in conjunction with the modulating economizer to meet the cooling requirement. While the unit is operating using outdoor-air, Compressor no. 2 cannot be energized. If enthalpy is above setting on enthalpy switch, the economizer outdoor-air dampers move to the minimum (ventilation) position, and condenser fans nos. 1 and 2 cycle on and off as described in Cooling, Units Without Economizer section on page 23.

NOTE: If fan switch is in ON position, and the room thermostat is satisfied, the outdoor-air dampers move to the minimum position.

**HEATING, UNITS WITH ECONOMIZER** — Operation is the same as described in Heating, Units Without Economizer section on page 23, except that the outdoor-air dampers move to the minimum position.

**BUILDING PRESSURIZATION MODE** — Building pressurization is used to pressurize conditioned space in the event of a fire or smoke condition. For building pressurization mode to work effectively, unit must be equipped with economizer option. On a large building with multiple zones, it may be desirable to pressurize a zone that does not have smoke in it to keep smoke from entering the zone from other zones that may be filled with smoke.

In building pressurization mode, supply-air fan operates with outdoor-air dampers wide open (on units with economizer) and, if unit is equipped with power exhaust option, the power exhaust fan off. This pumps outdoor air into the zone but does not exhaust it, resulting in the zone becoming positively pressurized.

All switches and wiring required for building pressurization must be field supplied and wired.

To go into pressurization mode, power to the control circuit must be interrupted. This can be done using alarm relay contacts described in 115-V Connections section on page 17. These contacts can be energized by a relay in a smoke detector, a firestat, or by a relay that is manually energized in a central control room. Switches must be field installed to energize supply-air fan and drive economizer dampers wide open. After power to control circuit is interrupted, these switches must be manually closed to put unit into pressurization mode; switches would probably be located in central control room. If unit is equipped with return/exhaust fan option, return-air fan should be off.

**SMOKE PURGE MODE** — In order to use smoke purge, unit must be equipped with power exhaust option.

Smoke purge is used to exhaust smoke from a zone in the event of a fire or heavy smoke condition. In this mode, power exhaust fan runs, supply fan is shut off, and economizer dampers are wide open. With power exhaust fan running and exhaust damper wide open, smoke-filled air is exhausted out of the conditioned space to the outdoors.

With smoke purge mode, it is necessary to interrupt power to unit control circuit as described above for building pressurization. All switches and wiring for putting unit into smoke purge mode must be field supplied and installed. Terminals have been provided in unit control box to facilitate field hookups.

The field-installed switches must energize return-air fan and drive economizer dampers wide open. After power is interrupted to unit control circuit, these switches must be manually closed to place unit into smoke purge mode. As

with building pressurization switches, these switches would probably be located in a central control room.

NOTE: With both building pressurization and smoke purge modes, do not overpressurize the zone; unit will keep pumping air in or exhausting air out until told to do otherwise.

**Ventilation Air Circulation (Continuous Fan)** — Set unit power at ON position, system selector switch at OFF, HEAT, or COOL position and fan switch at ON position.

Evaporator-fan contactor is energized through the switch on the thermostat and the evaporator fan runs continuously.

**Automatic Changeover Using Automatic Changeover Thermostat** — Set unit power at ON position, and system selector switch at AUTO position.

When the temperature of the conditioned space rises to the cooling selector lever setting, unit automatically switches from the heating mode to the cooling mode. When the temperature of the conditioned space falls to the heating selector switch setting, unit automatically changes from cooling mode to heating mode. The thermostat is interlocked so that cooling and heating systems do not operate at the same time.

**Head Pressure Control** — All units have a fan cycling thermostat which cycles the no. 2 condenser fan. (The no. 2 condenser fan is located over the control box.) This switch opens at  $60\text{ F} \pm 3^\circ\text{ F}$  and closes at  $70\text{ F} \pm 3^\circ\text{ F}$ . This allows the unit to operate down to  $20\text{ F}$  outdoor ambient temperature.

NOTE: Accessory Motormaster® head pressure control is available which allows mechanical cooling down to  $-20\text{ F}$ .

## SERVICE

**Service Access** — All unit components can be reached through clearly labeled removable access panels, with the exception of the unit control box. Access to the unit control box is through a hinged access door.

Access panels are held in place by 2 latches (one on each side) and 4 screws in the bottom flange. To remove panels:

1. Loosen the latch bolt using a  $\frac{5}{16}$ -in. wrench and pivot the latches so they are not in contact with the panel.
2. Using a  $\frac{3}{8}$ -in. wrench, remove the 4 screws in the bottom flange.
3. Pull the bottom of the panel out and down to remove.

To replace panel:

1. Place top edge of panel under drip lip at top.
2. Push panel up and in.
3. Replace 4 screws at the bottom.
4. Tighten latches.

The control box access door is not equipped with tie-backs, so if heavy-duty servicing is needed, either remove the door or prop it open to prevent accidental closure.

The door is held closed with 3 latches. The latches are secured to the unit with a single  $\frac{1}{4}$ -in.  $-20 \times \frac{1}{2}$ -in. long bolt. To open, loosen the latch bolt using a  $\frac{7}{16}$ -in. wrench. Pivot the latch so that it is not in contact with the door, and open the door. To shut, reverse the above procedure.



NOTE: Disassembly of the top cover may be required under special service circumstances. It is very important that the orientation and position of the top cover be marked on the unit prior to disassembly. This will allow proper placement of the top cover onto the unit and prevent rain water from leaking into the unit.

**IMPORTANT:** After servicing is completed, make sure door and panels are closed and latched properly, and that all latches are tight and all screws are replaced and tight. Failure to do this can result in water leakage into the evaporator section of the unit.

**COMPRESSORS** — Access to the compressors is through the access panel on the right side of the unit (when facing the condenser coil). This panel also provides access to the crankcase heaters and the high- and low-pressure switches. Compressor no. 1 is compressor closest to the condenser coil.

**EVAPORATOR-FAN MOTORS, PULLEYS, AND BELTS** — Access to these components is through the panel labeled **FAN SECTION** on the left side of the unit (when facing condenser coil).

**FILTER DRIERS** — Access to the filter driers is through the panel on the right on the evaporator end of the unit (end opposite the condenser coil).

**UNIT CONTROL BOX** — Access to this component is through the panel marked **ELECTRICAL SECTION** on the left side of the unit (when facing condenser coil). See Fig. 14 for control box component locations.

**GAS HEAT SECTION** — Access to the gas heat section is through the panel labeled **HEAT SECTION** on the left side of the unit (when facing condenser coil). See Fig. 21 and 22.

All gas system components are in the gas section, except the limit switch(es). Find the limit switch(es) in the upper right side of the compressor section, behind the suction bell of the right compressor. Limit switch(es) is covered by a rainshield and held in place by 2 screws.

**MAIN AND PILOT BURNERS** — At the beginning of each heating season, inspect for deterioration due to corrosion or other causes. Observe the pilot and main burner flames through the viewport (contained in the condenser section), and adjust if necessary. See Automatic Pilot Adjustment section on page 28 or Main Burner Adjustment section on page 28.

**FLUE GAS PASSAGEWAYS** — The flue collector box and heat exchanger cells may be inspected by removing the combustion-air blower(s), flue box cover, and main burner assembly. See Fig. 21 and 22 for proper removal sequence. If cleaning is required, remove heat exchanger baffles through the flue box and clean all parts with a wire brush. When replacing heat exchanger baffles, be sure to replace screw through clamp on baffle retaining rod into the vestibule plate.

**COMBUSTION-AIR BLOWER** — Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during the heating season. For first heating season, inspect blower wheel bimonthly to determine proper cleaning frequency. Inspect wheel by shining a flashlight into the opening. If cleaning is required, remove blower assembly from unit and then disassemble as shown in Fig. 23.

**ELECTRIC HEAT CONTROL BOX** (Fig. 24)

**50LJ Units** — On these units, access to the electric heat control box is through the panel marked **FAN SECTION** on the back end of the unit. (End opposite condenser coil.) Be sure to use the correct panel, as there are 3 panels labeled **FAN SECTION**.

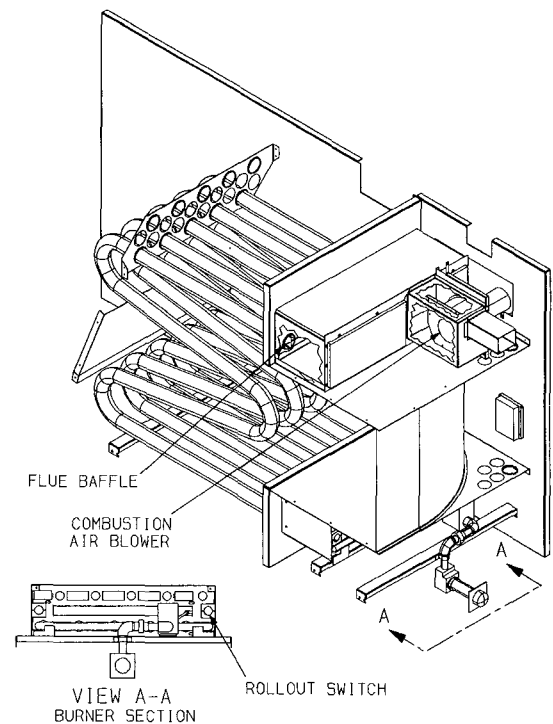
**50LW Units** — On these units, access to the electric heat control box is through the panel marked **HEAT SECTION**.

**HEATER BOX**

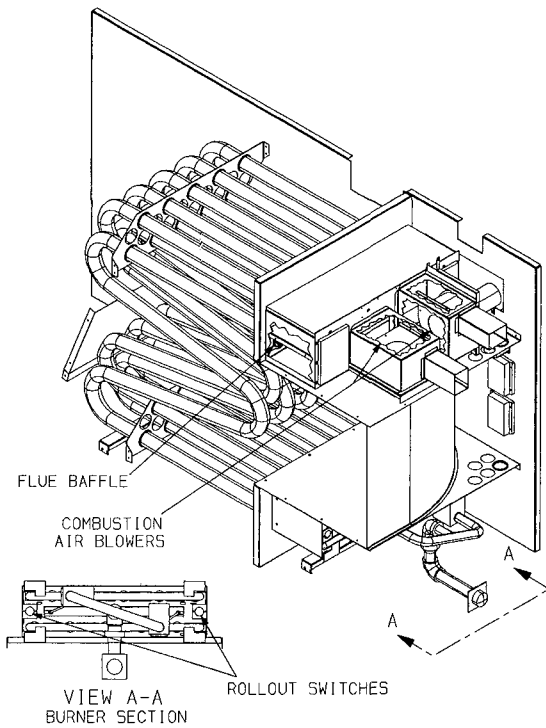
**50LJ Units** — Access to the heater box on these units is through the last panel on the left side of the unit (when facing condenser coil). Panel is marked **FAN SECTION**. Box is mounted directly under evaporator fan.

**50LW Units** — Access to the heater box on these units is through the panel marked **HEAT SECTION**.

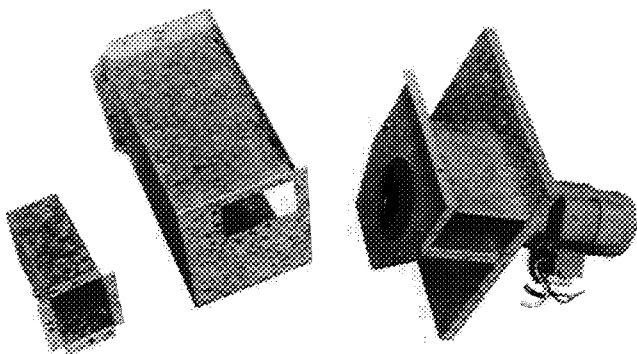
NOTE: Only the heater element connectors are located in the heater box. The heater elements themselves are in the airstream.



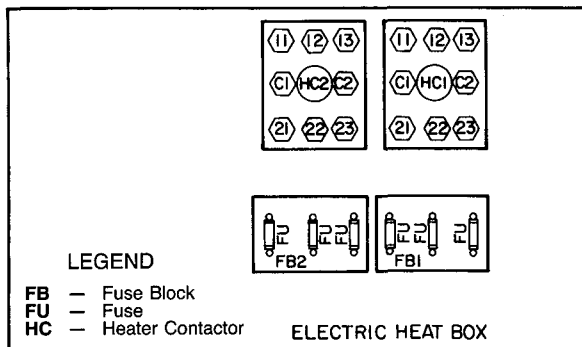
**Fig. 21 — Gas Section Detail, 48LJD (Low Heat)**



**Fig. 22 — Gas Section Detail, 48LJE (High Heat)**



**Fig. 23 — Combustion Blower Removal**



**Fig. 24 — Typical Electric Heat Control Box Component Arrangement**

**ECONOMIZER DAMPER MOTOR** — On units so equipped, the economizer motor is located on a bracket in the return-air section. Access to it is through the panel labeled **FILTER SECTION** on the far end of the unit (when facing condenser coil).

**POWER EXHAUST MOTOR** — Remove the power exhaust hood to gain access to motor.

**RETURN-AIR FILTERS** — Access to these filters is through the panel marked **FILTER SECTION**.

**CONDENSER FANS AND FAN MOTORS** — Remove the wire fan guard on top of the unit to gain access to the condenser fans and motors.

**Cleaning** — Inspect unit at the beginning of each heating and cooling season and during each season as operating conditions may require.

Clean condenser coil with a vacuum cleaner, fresh water, compressed air, or a bristle brush (not wire). Coil cleaning should be a part of the planned maintenance program. Clean evaporator coil with a stiff bristle brush (not wire), vacuum cleaner, or compressed air.

Check and clean condensate drain annually at the start of the cooling season. In winter, keep drain and traps dry and protect against freeze-up.

Replace return-air filters at the start of each heating and cooling season and as often as necessary during each season, depending on operating conditions. See Tables 1a and 1b for filter types, quantities, and sizes.

Remove economizer outdoor-air filters from the hoods by removing the filter retainers. Clean filters with steam or hot water and mild detergent. Reinstall in hoods after cleaning. Never replace cleanable filters with disposable filters.

### Lubrication

**COMPRESSORS** — Each compressor is correctly charged at the factory.

**FAN SHAFT BEARINGS** — Lubricate fan shaft bearings at least once a year with suitable bearing grease. Typical lubricants are given below:

MANUFACTURER	LUBRICANT
Texaco	Regal AFB-2*
Sunoco	Prestige 42
Texaco	Multifak 2
Mobil	Mobilplex EP No. 1

\*Preferred lubricant because it contains rust and oxidation inhibitors.

**FAN MOTOR BEARINGS** — The condenser-fan motors and the evaporator-fan motor(s) have sealed bearings, so no field lubrication is required.

**DOOR HINGES** — The control box door hinges should be lubricated at least once a year.

### Adjustments

**EVAPORATOR-FAN MOTOR PLATE** — Adjust using a  $\frac{1}{16}$ -in. wrench on the bolts shown in Fig. 25 and 26. Turn the bolts counterclockwise to move the motor mounting plate toward the fan and loosen the belts; turn clockwise to move the plate away from the wheel and tighten the belts. Make the same number of turns to each bolt.

## BELT INSTALLATION AND TENSIONING

NOTE: When installing or replacing belts, always use a complete set of new, matched belts. Mixing belts often results in premature breakage of the new belts.

1. Turn off unit power.
2. Adjust motor plate so belts can be installed without stretching over the grooves of the pulley. (Forcing the belts can result in uneven belt stretching and a mismatched set of belts.)
3. Before tensioning the belts, equalize belt slack so that it is on the same side of the belt for all belts. Failure to do so may result in uneven belt stretching.
4. Tighten belts using the motor plate adjusting bolts.
5. Adjust until proper belt tension ( $\frac{1}{2}$ -in. deflection with one finger) is obtained. Be sure to adjust both adjusting bolts the same number of turns.
6. Check the tension at least twice during the first day of operation; there is normally a rapid decrease in tension until the belts have run in. Check tension periodically thereafter and keep it at the recommended tension.

With the correct belt tension, belts may slip and squeal momentarily on start-up. This slippage is normal and disappears after wheel reaches operating speed. Excessive belt tension shortens belt life and may cause bearing and shaft damage.

**PULLEY ALIGNMENT** — For proper belt life, the motor and fan pulleys must be properly aligned. To check:

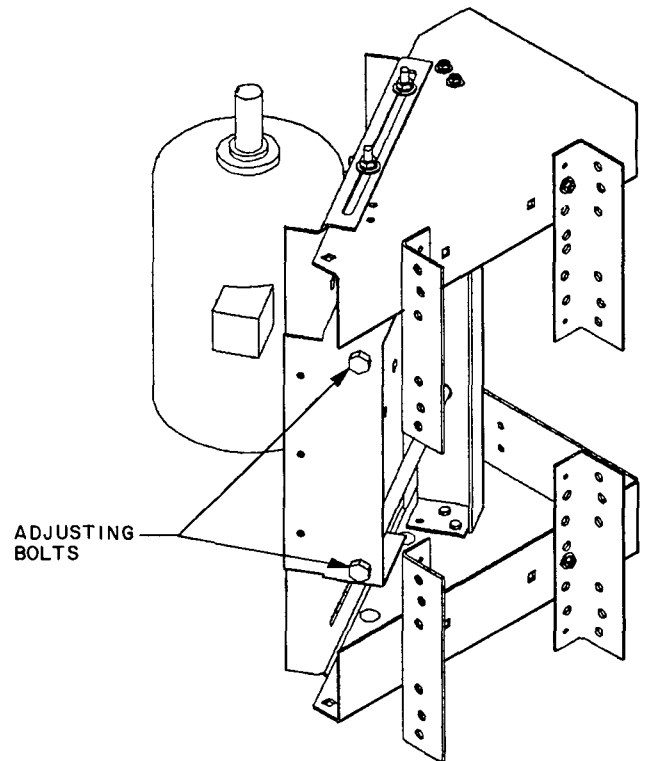
1. Turn off unit power. See Fig. 27.
2. Place a straight edge against the motor and fan pulleys. If the pulleys are properly aligned, the straight edge should be parallel to the belts.
3. If they are not parallel, check that the motor shaft and fan shaft are parallel. If they are not, adjust the motor plate adjusting bolts until they are.
4. After verifying that the shafts are parallel, loosen the setscrews on the motor pulley.
5. Move pulley on the shaft until the pulleys are parallel.
6. To move the sheave on the shaft, loosen the belts. If necessary, blower pulley can also be moved on the shaft.

**INSTALLING FIELD-SUPPLIED ALTERNATE MOTOR PULLEY** — To install the alternate pulley:

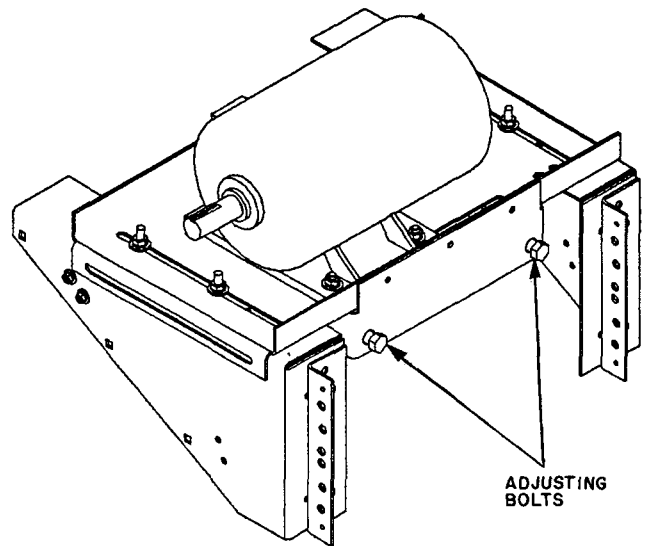
1. Turn off unit power.
2. Loosen belts using motor adjusting bolts until belts can be removed without stretching them over the grooves of the pulley.
3. Remove belts.
4. Loosen setscrews on motor pulley.
5. Slide pulley off motor shaft. Make sure setscrews on new pulley are loose.
6. Slide new pulley onto fan shaft and align it with the fan pulley as described above.
7. Tighten setscrews.
8. Install belts and tension properly as described above.

**CONDENSER FAN** — To adjust condenser fans:

1. Turn off unit power.
2. Remove fan guard and loosen fan hub setscrew.

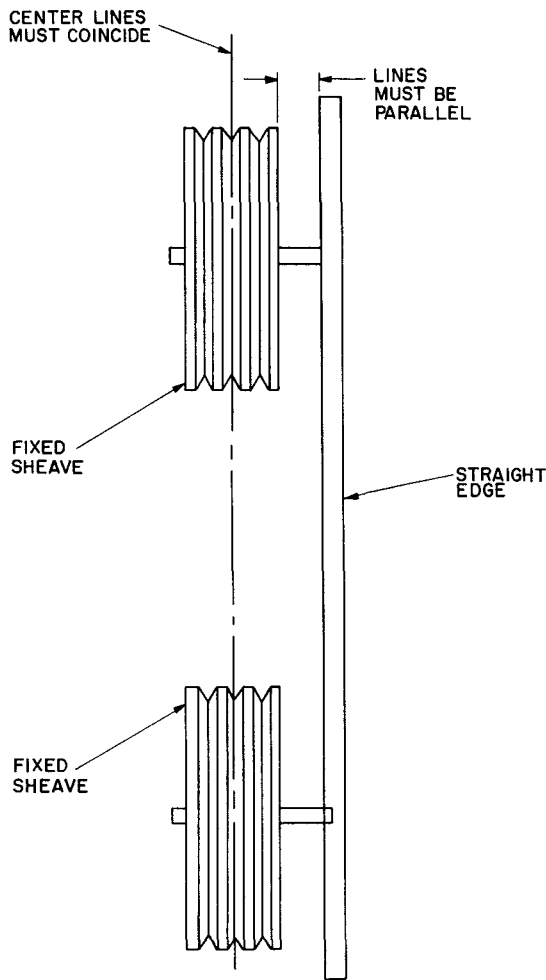


**Fig. 25 — Evaporator-Fan Adjustment — Models 48LJ, 50LW**



**Fig. 26 — Evaporator-Fan Motor Adjustment — Model 50LJ**

3. See Fig. 20 and adjust fan height using a straight edge laid across the fan deck.
4. Tighten setscrew and replace rubber hubcap to prevent hub from rusting to the motor shaft. Fill hub recess with Permagum if hub has no rubber hubcap.
5. Replace fan guard.



**Fig. 27 — Pulley Adjustment**

**PILOT LIGHT OFF** — If pilots do not light as described in Heating section on page 23, be sure that pilot orifice is unobstructed, then check for spark ignitor malfunctions.

If pilot flame is not sensed within 90 seconds, pilot and main gas valves will close and will remain off for a 330-second purge before ignition retry. The ignitor will retry ignition indefinitely while a call for heating exists.

1. Shut off control supply power to Ignitor Control Pack (ICP).
2. Check that spark gap is  $\frac{1}{8}$ -in.  $\pm$   $\frac{1}{32}$  inch.
3. Check that ICP is securely grounded.
4. Check that the high-voltage lead is securely connected between ICP and electrode body.
5. Restore power to ICP. Check that 24 v is supplied to terminal TH of the ICP.
6. Check unit label diagram for correct terminal usage if any wires are removed.

#### AUTOMATIC PILOT ADJUSTMENT

1. Set system selector switch at OFF position to shut off unit. Turn off power to unit.
2. Remove screw cap cover on pilot gas valve to expose adjusting screw.
3. To ensure that main burners do not ignite, remote wire from gas valve terminal 2. Tape wire. Do not allow wire to be grounded.
4. Turn on power to unit. Set system selector switch to HEAT position and set thermostat to a setting that will call for heat. Pilot ignites.

5. With a small screwdriver, turn adjustment screw until flame fully engulfs sensor.
6. Replace cap on pilot gas valve. Turn off power to unit. Return valve(s) to original position.
7. Check for proper burner operation by cycling the burners. Wait 30 seconds between burner cycles.
8. Check that all doors are closed securely before leaving the unit.

**GAS VALVE ADJUSTMENT** — The gas valve opens and closes in response to the thermostat or limit control. When power is supplied to valve terminal 3 (D1 on low-heat), the pilot valve opens to the preset position. When power is supplied to terminal 2 (W1 on low-heat), the main valve opens to its preset position.

The regulator factory manifold pressure setting is stamped on the valve body (2.7 in. wg on high-heat units and 2.9 in. wg on low-heat units).

Manifold pressure is the pressure at the factory-supplied pressure tap on the manifold downstream of the gas valve. This is not the same as the pressure at the tap on the gas valve body. Always use the tap on the manifold to read manifold pressure.

To adjust regulator:

1. Set thermostat at setting for no call for heat.
2. Turn main gas valve to OFF position.
3. Install a suitable pressure measuring device.
4. Set main gas valve to ON position.
5. Set thermostat to call for high fire (W2).
6. Remove screw cap or plastic cover covering the regulator adjustment screw.
7. Turn adjustment screw clockwise to increase pressure or counterclockwise to decrease pressure.
8. Once desired pressure is established, remove pressure-measuring device and replace the screw cap.

**MAIN BURNER ADJUSTMENT** — Main burners are factory set and should require no adjustment. However, if burner adjustment is necessary:

1. Perform Automatic Pilot Adjustment as instructed above.
2. Turn gas valve to ON position. Allow unit to operate at least 15 minutes with heat section access panel closed.
3. Open heat section access panel.
4. Loosen primary air shutter and adjust to a minimum opening of  $\frac{5}{8}$  inch.
5. Retighten primary air shutter and close access panel.

To check ignition of main burners and fan switch operation, move thermostat dial above and below room temperature several times, pausing at least one minute between cycles.

#### MAIN BURNER REMOVAL

1. Shut off main gas valve.
2. Shut off power to unit.
3. Unplug PL9, (and PL10 on high heat) and all sensor and ignitor wires.
4. Disconnect gas connection(s) from between gas valve(s) and field-supplied piping. See Fig. 21 and 22.
5. Remove 2 screws securing burner assembly to unit.
6. Slide burner assembly from unit.

**NOTE:** For high-heat units (Models 48LJE) the side posts must be removed before the burner assembly can be removed.

ENTHALPY CONTROL, MAT, AND ECONOMIZER DAMPER VENT POSITION — See Installation section of this publication for adjustment procedures.

AUXILIARY SWITCH — All units have an auxiliary switch located on the economizer damper motor. This switch is factory set to prevent the power exhaust from operating when the economizer damper is less than 50% open. If other than the factory setting is desired, follow the steps below.

**CAUTION**

Do not turn motor shaft by hand or with a wrench. Damage to the gear train will result.

1. Remove top cover from motor to gain access to motor terminals and cam adjustments.
2. Disconnect controller from motor. Connect red, white, and blue terminals on the 135 ohm manual potentiometer to corresponding red, white and blue terminals on the motor. Connect 24-vac power to Terminals 1 and 2. See Fig. 28.
3. Adjust the 135-ohm potentiometer so that the motor shaft turns to the position where auxiliary equipment is to be switched.
4. Adjust auxiliary cam by inserting a 1/8-in. straight blade screwdriver into slot on cam and moving TOP of screwdriver to the right or left. See Fig. 29.
5. To close auxiliary switch red and blue contacts as the motor travels open (energizing the power exhaust motor), the switch differential can only be 10 degrees on both switches. To adjust either cam, perform the following steps:
  - a. If red and blue contacts are open, rotate the cam counterclockwise until the contacts close.
  - b. If the red and blue contacts are closed, rotate the cam clockwise until the contacts open.
6. Check for proper auxiliary switching (including differential) by running motor through full stroke, using 135 ohm potentiometer. Repeat adjustment if necessary.
7. Disconnect 135 ohm potentiometer, reconnect controller and place top cover on motor.

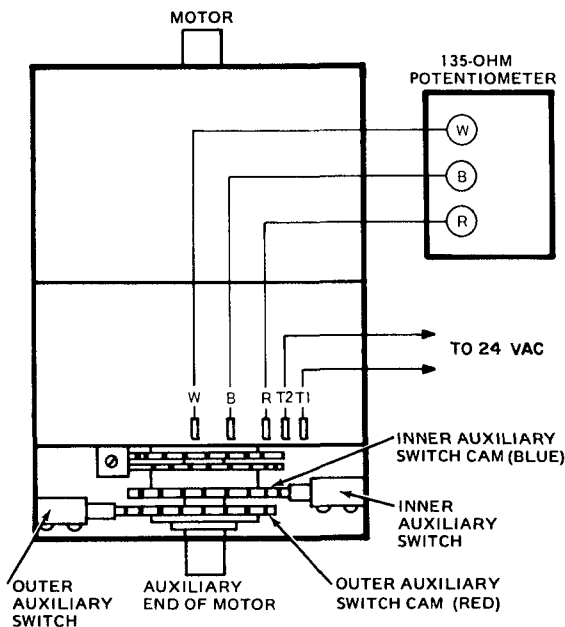


Fig. 28 — Auxiliary Switch Stroke Adjustment

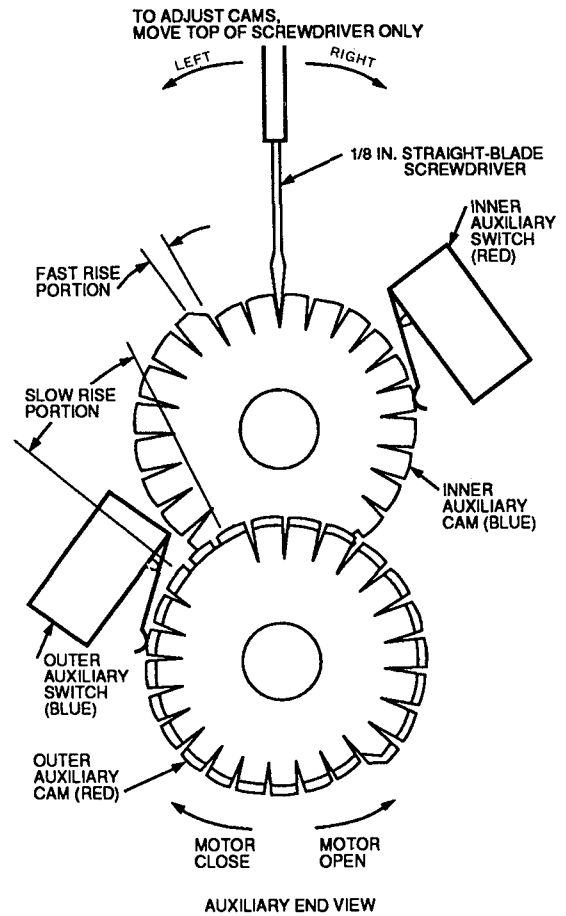


Fig. 29 — Auxiliary Switch Adjustment

NOTE: Adjusting the auxiliary switch does not require running the motor.

REFRIGERANT CHARGE — All units are shipped with a complete operating charge of R-22. See unit nameplate and Tables 1a and 1b for amount of charge. When charging refrigerant system, refer to Carrier Standard Service Techniques, Refrigerants section. When adding a complete charge, evacuate system using standard evacuating procedures and weigh in the specified amount of charge. See Fig. 30 for refrigerant circuit charging chart.

Refrigerant Feed Components — Each refrigerant circuit (2 per unit) has all the necessary refrigerant controls.

Acutrol™ Refrigerant Metering Device — Each circuit has 12 non-adjustable metering devices. They control the flow of liquid refrigerant to the evaporator coils.

Filter Drier — Replace whenever refrigerant system is exposed to atmosphere.

**Protective Devices**

**COMPRESSOR PROTECTION**

Overcurrent (208/230 v only) — Each compressor has one manual reset, calibrated trip, magnetic circuit breaker. Do not bypass connections or increase the size of the circuit breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

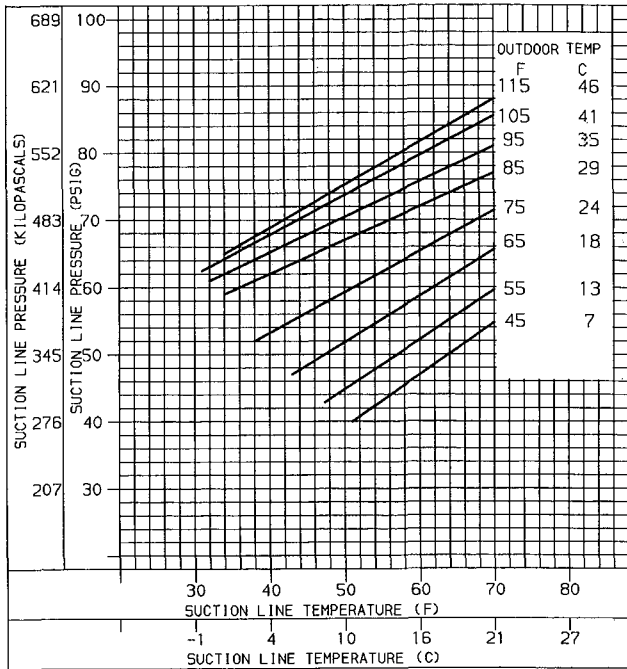


Fig. 30 – Charging Chart

**Overtemperature** — Each compressor has an internal protector to protect it against excessively high discharge gas temperatures.

**Crankcase Heater** — Each compressor has a 70-watt crankcase heater to prevent absorption of liquid refrigerant by oil in the crankcase when the compressor is idle. Since 115-v power for the crankcase heaters is drawn from the unit control circuit, main unit power must be on for the heaters to be energized.

**IMPORTANT:** After a prolonged shutdown or service job, energize the crankcase heaters for 24 hours before starting the compressors.

**Compressor Lockout** — If any of the safeties (high-, low-pressure, compressor internal thermostat) trip, or if there is loss of power to the compressors, the constant volume control board will lock the compressors off. To reset, manually move the thermostat setting.

**EVAPORATOR FAN MOTOR PROTECTION** — A manual reset, calibrated trip, magnetic circuit breaker protects against overcurrent. Do not bypass connections or increase the size of the breaker to correct trouble. Determine the cause and correct it before resetting the breaker.

**CONDENSER-FAN MOTOR PROTECTION** — Each condenser-fan motor is internally protected against over-temperature. Each motor is also protected against a severe overcurrent condition by manual reset, calibrated trip, magnetic circuit breakers. As with the circuit breakers described previously, do not bypass connections or increase breaker size to correct trouble. Determine the cause and correct it before resetting the breaker.

**HIGH- AND LOW-PRESSURE SWITCHES** — See Fig. 31 for compressor mounting locations. Settings for these switches are shown in Table 6. If either switch trips, or if the compressor overtemperature switch activates, that refrigerant circuit will be automatically locked out by the constant volume control board. To reset, manually move the thermostat setting.

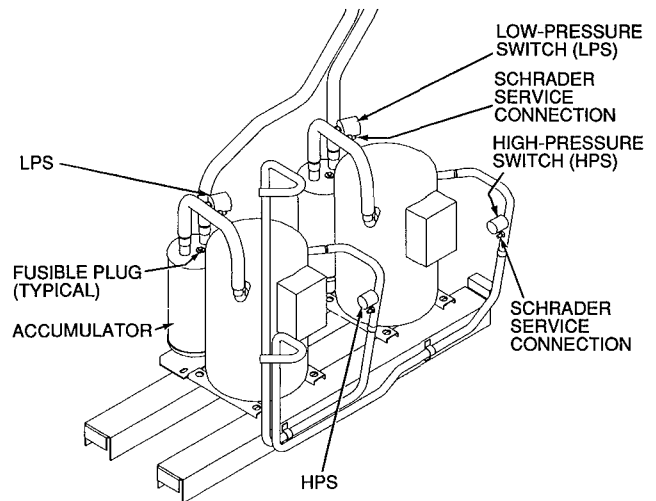


Fig. 31 – Compressor Components

Table 6 – Pressure Switch Settings (psig)

SWITCH	CUTOUT	CUT-IN
High	426 ± 7	320 ± 20
Low	7 ± 3	22 ± 5

**Relief Devices** — All units have relief devices to protect against damage from excessive pressures (i.e., fire). These devices protect the high and low side.

**Control Circuit, 115-V** — This control circuit is protected against overcurrent by a 5-amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

**Control Circuit, 24-V** — This control circuit is protected against overcurrent by a 3.2-amp circuit breaker. Breaker can be reset. If it trips, determine cause of trouble before resetting.

### Gas Heat

**LIMITS SWITCHES** — The maximum supply air temperature is controlled by a limit switch located in the compressor section. The limit is designed to trip at 100° F above the maximum temperature shown in Table 1.

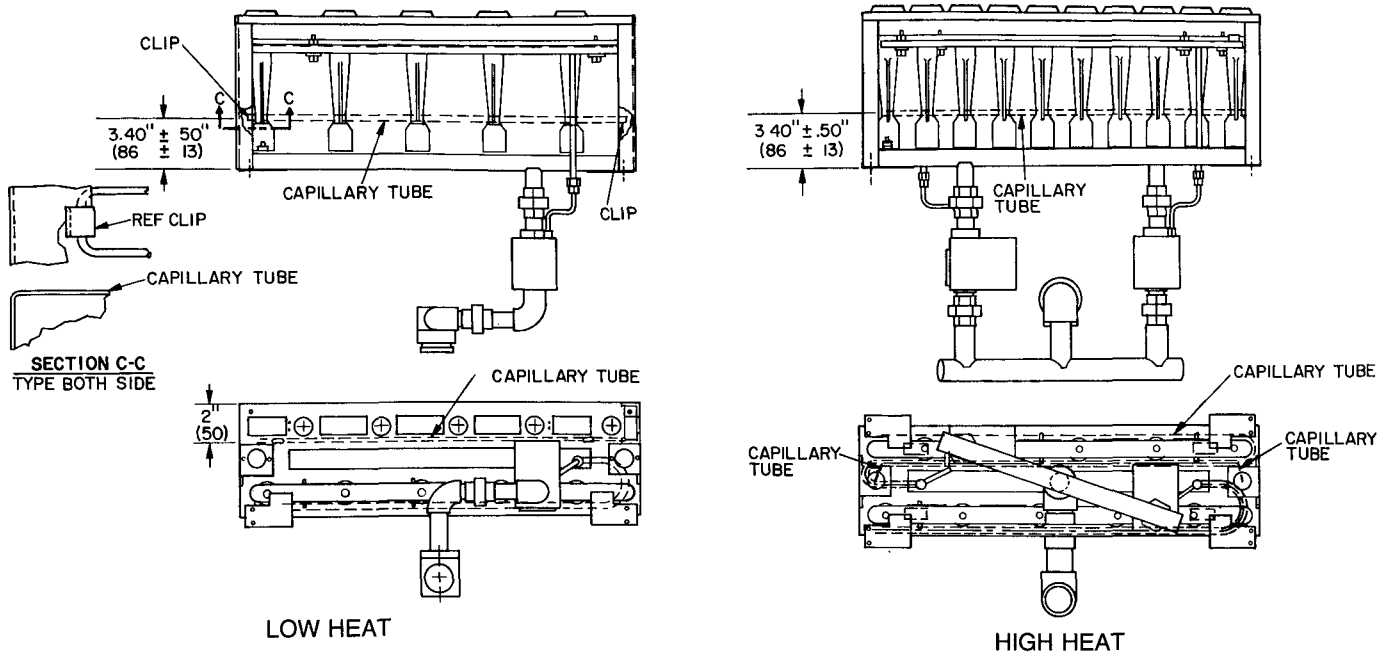
When the limit trips, the gas valve is deenergized and the combustion air blower(s) and evaporator fan are held on until the unit is cooled to its reset temperature. Once the unit cools, the gas valve is reenergized.

If the thermostat stops calling for heat after the limit switch trips, the combustion-air blower and evaporator fan are held on until the limit cools to its reset temperature.

**ROLLOUT SWITCH** — This switch senses any flame or excessive heat in the main burners and deenergizes the gas valve. If this occurs, the gas heating system is locked out until the rollout switch is reset manually. Reset by pressing the button on the rollout switch. See Fig. 21 and 22.

When the rollout switch trips, it likely indicates a flue blockage. Inspect the unit for any obstruction in the flue system, for holes on the flue box, or for a defective centrifugal switch or a loose combustion blower. See Fig. 32 for proper location of the rollout capillary.

**AIRFLOW SWITCH, 48LJE (HIGH HEAT) UNITS ONLY** — Shuts off the gas heat in the event there is a loss of air over the gas cells. The airflow switch is located in the fan section (see Fig. 5a — 5c). The switch will automatically reset when airflow is sufficient.



**Fig. 32 – Location of Rollout Switch Capillary Tube**

### Electric Heat

**OVERCURRENT** — Heaters are protected by fuses in the power circuit, located in the heater control box. As with circuit breakers, determine the cause of fuses tripping before replacing them. Do not replace with larger fuses. All fuses are 60 amp, except for the 18-kW, 460-v heater, which uses 35-amp fuses.

**OVERTEMPERATURE** — Heaters are protected by limit switches mounted in the heater box. They reset automatically once they cool.

**Control Board Checkout** — The following tools are required to perform the troubleshooting tasks detailed in this section:

- 1.5-v battery
- 2 sets of jumper wires with alligator clips
- Multimeter
- Toggle switch with 14-in. wires terminated with ¼-in. spade connectors

### **▲ DANGER**

Read these instructions completely before attempting to troubleshoot the control board. Failure to follow the steps precisely could result in damage to unit, personal injury or death.

The control board checkout procedure consists of 3 parts:

1. A basic check to verify availability of 24 and 115 v to the control board.
2. A detailed check of each circuit within the board.
3. A continuity check for the economizer board.

**BASIC CHECK** — Refer to Fig. 33 for control board component identification.

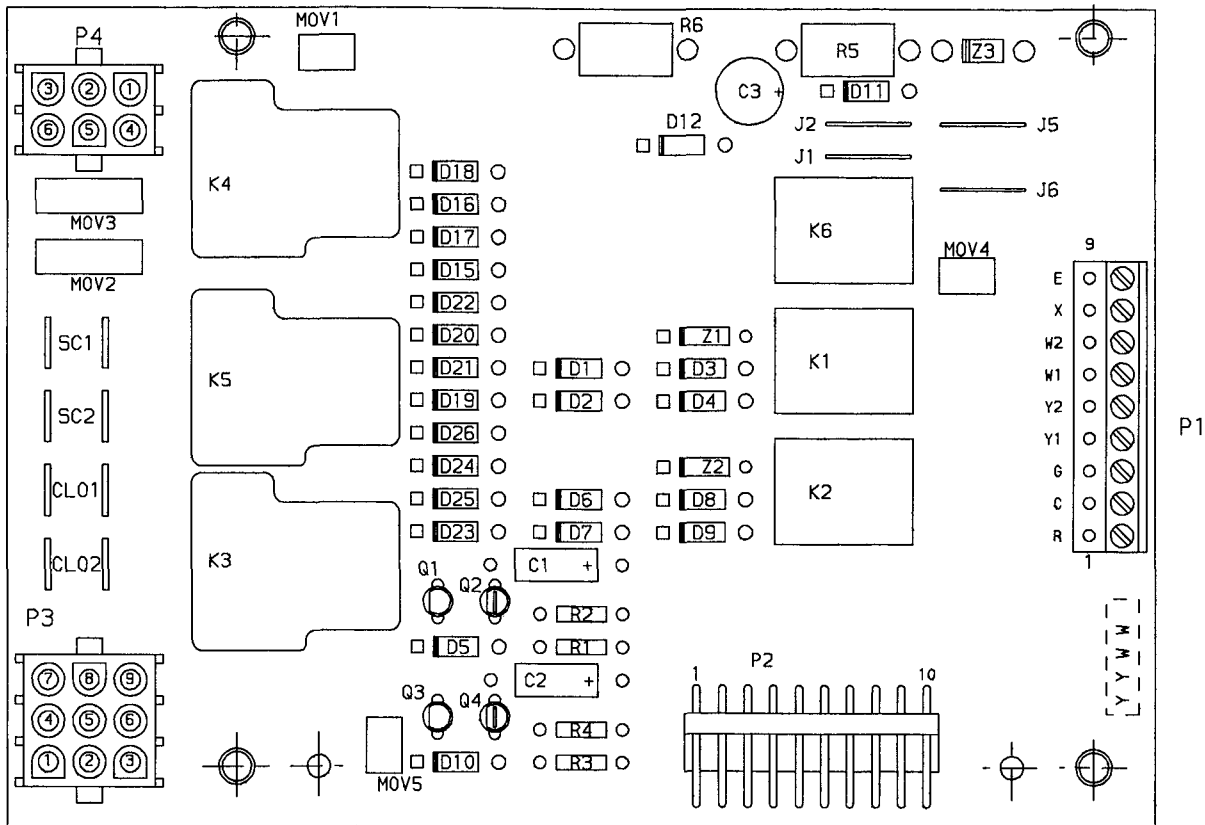
**IMPORTANT:** If unit is equipped with an economizer option, disconnect and remove the economizer control board.

**NOTE:** All plugs (except P1) are labeled for easy identification. Plug P1 can be identified by its orange color.

1. Turn unit power off. Disconnect plug P1 from control board.
2. Turn unit power on and check voltage across Pin R and Pin C at plug P1. If voltage reads 18 to 30 v, skip to Step 5.
3. Turn unit power off. Disconnect plug P3.
4. Turn unit power on and measure voltage across wires on plug P3, Pins 1 and 2 (wires coming from the unit). If voltage reads 18 to 30 v, there is either a bad connection between plug P3 and control board, or the control board is defective. Verify the connection at this point and proceed to Step 5. If there is no voltage, check the circuit breaker and transformer in the 24-v control circuit of the unit.
5. Turn unit power off and disconnect plug P4 from the control board.
6. Switch scale on meter to read 115 v.
7. Turn unit power on and check voltage across Pin 6 on plug P4 and unit ground (wires coming from the unit). If voltage reads 104 to 122 v, there is adequate power available to the board. Verify connection at this point and proceed to Step 8 below. If there is no voltage, check the circuit breaker and transformer in the 115-v control circuit of the unit.
8. After verifying that 24-v and 115-v supply power is available to the control board, turn power off and reconnect plugs P1, P3 and P4. Proceed to Detailed Check section below.

### DETAILED CHECK

**NOTE:** Plug P1 must be disconnected in order to perform any of the troubleshooting steps detailed in this section. To save time, reconnect plug P1 only after you have completed all of the required troubleshooting.



**Fig. 33 – Control Board Component Arrangement**

Symptom: Evaporator Fan Will Not Operate.

1. Turn unit power off and disconnect plug P1 from the control board.
2. Install a jumper across Pin R and Pin G at plug P1 on the control board.
3. Turn unit power on and check if the evaporator-fan contactor (IFC) coil has been pulled in. If the contactor has not been pulled in, check the voltage across the IFC coil. If there is voltage at this point, the IFC contactor is defective. If there is no voltage, proceed to Step 4.
4. Turn unit power off and disconnect plug P4 from the control board.
5. Turn unit power on and check for continuity across Pin 6 and Pin 3 at plug P4 on the control board. If there is no continuity, the board is defective. Replace control board. If there is continuity, then there is a bad connection between the board and plug P4. Correct the connection.
6. Turn unit power off. Reconnect plug P1 (if troubleshooting is complete) and plug P4.

Symptom: Condenser Fan No. 1 Will Not Operate.

1. Turn unit power off. Disconnect plugs P1 and P3 from the control board.
2. Check for continuity between Pin 8 at plug P3 on the control board and Pin Y1 on the control board. If there is no continuity, the board is defective. If there is continuity, either the connection is bad between plug P3 and the control board or the problem is external to the board. Reconnect plug P1 (if troubleshooting is complete) and plug P3 to the board.

Symptom: Condenser Fan No. 2 Will Not Operate.

Check operation of condenser fan no. 1. If fan no. 1 operates properly, the problem is external to the board.

Symptom: Compressor No. 1 Will Not Operate.

1. Turn unit power off. Disconnect the 2 wires attached to the terminals marked SC1.
2. Check continuity between the 2 wires. If there is no continuity, the problem is external to the control board (possibly the pressure switches). If there is continuity, proceed to Step 3.
3. Reconnect the wires removed in Step 1 above.
4. With the unit power still off, disconnect plug P1 from control board. Install a jumper wire across Pin R and Pin Y1 at plug P1 on the control board.
5. Connect a voltmeter across the coil for Compressor no. 1 contactor.
6. Energize unit and monitor the voltage for a few seconds.

**IMPORTANT:** Do not run compressor too long.

7. a. If proper voltage is indicated at the contactor, but contactor fails to close, replace contactor.
- b. If voltage is indicated for a few seconds (i.e., the contactor momentarily pulls in and is then de-energized), the Compressor Lockout (CLO) logic has shut down the unit. This is an indication that the board is not sensing proper compressor current, or that one of the safeties has tripped. Proceed to Step 8 to verify compressor lockout logic operation.
- c. If proper voltage is indicated at the contactor and contactor closes, the board is operating properly.



8. To verify compressor lockout logic:

- Disconnect CLO sensor wires connected to CLO1 at the control board. Check wires for continuity. If there is no continuity, replace the sensor.
- Connect the multimeter to read voltage between Pin X at plug P1 and ground.
- Turn unit power on and check the multimeter. Within a few seconds the meter should indicate 24 v. If it does not, the control board is defective and must be replaced.
- Turn unit power off. Use a toggle switch to connect a fresh 1.5-v battery to the terminals marked CLO1 as shown in Fig. 34.

**⚠ CAUTION**

The negative (-Ve) pole of the battery must be connected to the inner terminal and the positive (+Ve) pole must be connected to the outer terminal as shown in Fig. 34.

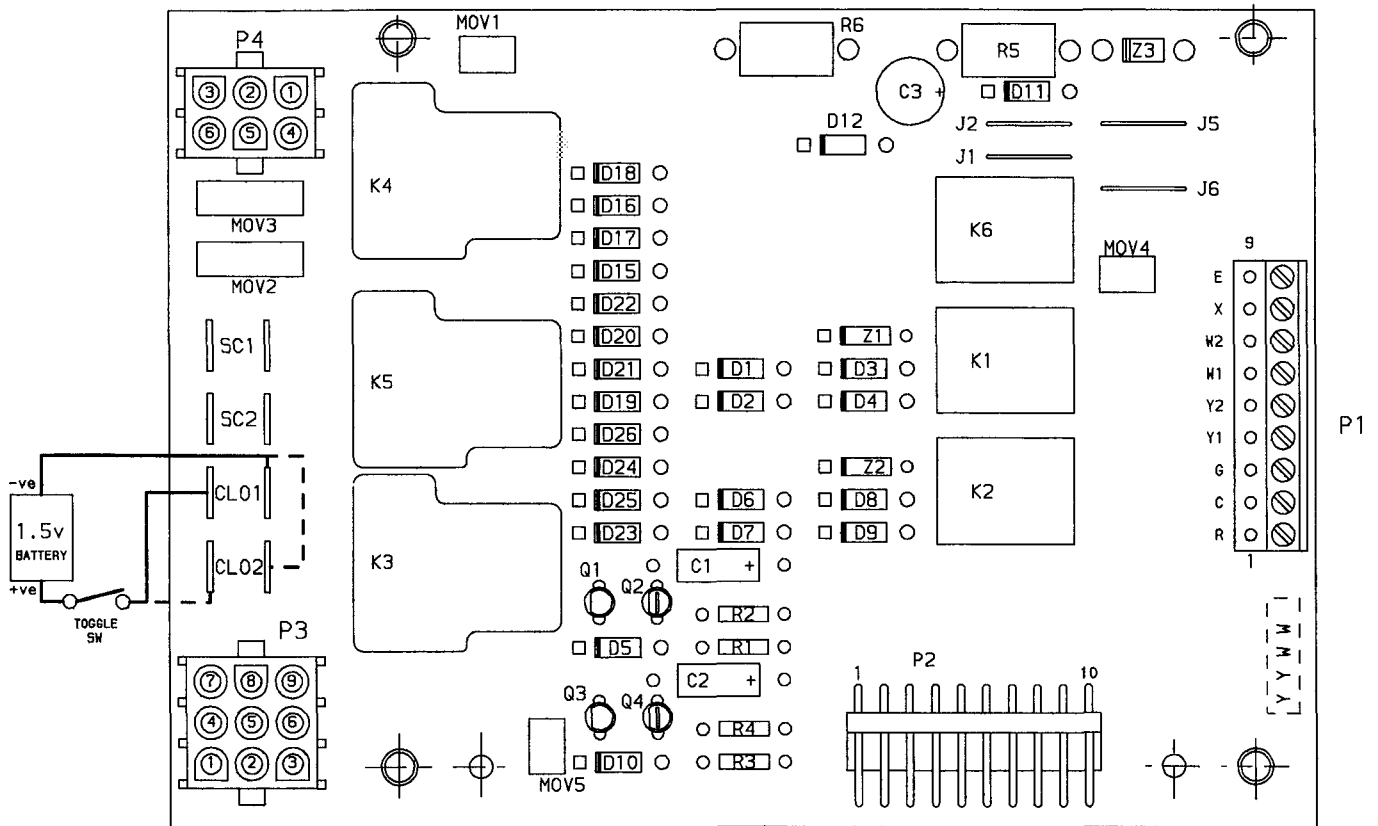
- Turn unit power on and use the toggle switch to make and break the connection between the outer CLO1 terminal and the positive (+Ve) pole of the battery.
- If the multimeter shows 24 v when battery is disconnected and no voltage when the battery is connected, the CLO logic is good. If the multimeter shows no change, the CLO logic is defective and the board must be replaced.

Symptom: Compressor No. 2 Will Not Operate.

- Be sure unit power is OFF. Disconnect the 2 wires attached to the terminals marked SC2.
- Check continuity between the 2 wires. If there is no continuity, the problem is external to the control board (possibly the pressure switches). If there is continuity, proceed to Step 3.
- Reconnect the wires removed in Step 1 above.
- Turn unit power off. Disconnect plug P1 from the control board and install jumper wire across Pins R and Y2 at plug P1. (This may have already been done in the Compressor no. 1 troubleshooting section.)
- Connect a voltmeter across the coil for Compressor no. 2 contactor.
- Energize unit and monitor the voltage for a few seconds.

**IMPORTANT: Do not run compressor too long.**

- If proper voltage is indicated at the contactor, but contactor fails to close, replace contactor.
- If voltage is indicated for a few seconds (i.e., the contactor momentarily pulls in and is then de-energized), the Compressor Lockout (CLO) logic has shut down the unit. This is an indication that the board is not sensing proper compressor current, or that one of the safeties has tripped. Proceed to Step 8 to verify compressor lockout logic operation.
- If proper voltage is indicated at the contactor and contactor closes, the board is operating properly.



**Fig. 34 – Compressor Lockout Connections**

8. To verify compressor lockout logic:
  - a. Disconnect CLO sensor wires connected to CLO2 at the control board. Check wires for continuity. If there is no continuity, replace the sensor.
  - b. Connect the multimeter to read voltage between Pin X on plug P1 and ground.
  - c. Turn unit power on and check the multimeter. Within a few seconds the meter should indicate 24 v. If it does not, the control board is defective and must be replaced.
  - d. Turn unit power off. Connect a fresh 1.5-v battery to terminal marked CLO2 as shown in Fig. 34.

**⚠ CAUTION**

The negative (-Ve) pole of the battery must be connected to the inner terminal and the positive (+Ve) pole must be connected to the outer terminal as shown in Fig. 34

- e. Turn unit power on. Make and break the connection between the outer CLO2 terminal and the positive (+Ve) pole of the battery.
- f. If the multimeter shows 24 v when the battery is disconnected and no voltage when the battery is connected, the CLO logic is good. If the multimeter shows no change, the CLO logic is defective and the board must be replaced. Remove all jumpers and replace all plugs except plug P1. (Replace plug P1 only if no further troubleshooting is required.)

**Symptom: First or Second Stage of Heating Will Not Operate.**

1. Turn unit power off. Disconnect plugs P1 and P3.
2. Check continuity between Pin W1 at plug P1 and Pin 5 at plug P3. If there is continuity, the board is good and the problem is either the connection at P3, or external to the control board. If there is no continuity, the control board is defective and must be replaced.
3. Check continuity between Pin W2 at plug P1 and Pin 7 at plug P3. If there is continuity, the board is good and the problem is either at the connection at plug P3 or external to the board. If there is no continuity, the board is defective and must be replaced. Reconnect plug P3 to the control board. (Reconnect plug P1 only if no further troubleshooting is required.)

**Symptom: Evaporator Fan Will Not Energize On a Call For Heat.**

1. Turn unit power off. Disconnect plug P1 and plug P4.
2. Install jumper wire between Pin R and Pin W1 at plug P1.
3. Turn unit power on. Check for continuity between Pin 6 and Pin 3 at plug P4 on control board.
4. If there is no continuity between these points, the board is defective and must be replaced.  
NOTE: The control board (part number HK37AA001) has no time delay.
5. If there is continuity between these points, the problem is at the connection at plug P4 or external to the control board.
6. Turn unit power off. Reconnect plugs P1 and P4.

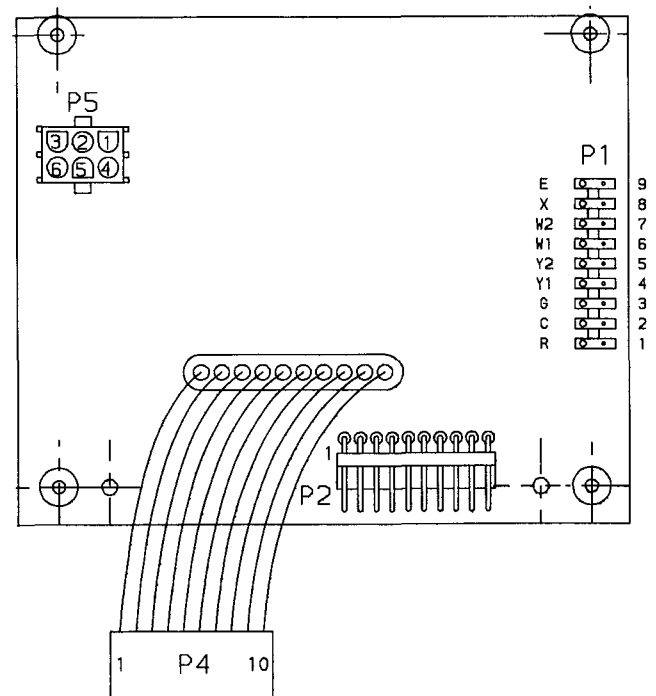
**ECONOMIZER BOARD CONTINUITY CHECK** — The economizer board is connection board that is used to interface the economizer circuit with the base unit and thermostat. There are no electronic components or logic built into this board.

1. Disconnect plugs P1 and P5 at the economizer control board. Disconnect the harness going from the economizer board to the unit control board.
2. Check continuity between points shown below. (See Fig. 35 for identification of points on the board.)

- P1-1 to P4-1
- P1-2 to P4-2
- P1-2 to P5-5
- P1-3 to P4-3
- P1-4 to P5-2
- P4-4 to P5-3
- P1-5 to P5-1
- P4-5 to P5-4
- P1-6 to P4-6
- P1-7 to P4-7
- P1-8 to P4-8
- P1-9 to P4-9
- P4-10 to P5-6











3. If there is continuity between the above points, the economizer board is good. Reconnect plugs P1 and P5 to the economizer board and connect the economizer harness to the unit control board.

If there is no continuity between the above points, the economizer board is defective. Replace board.




**Fig. 35 — Economizer Board**

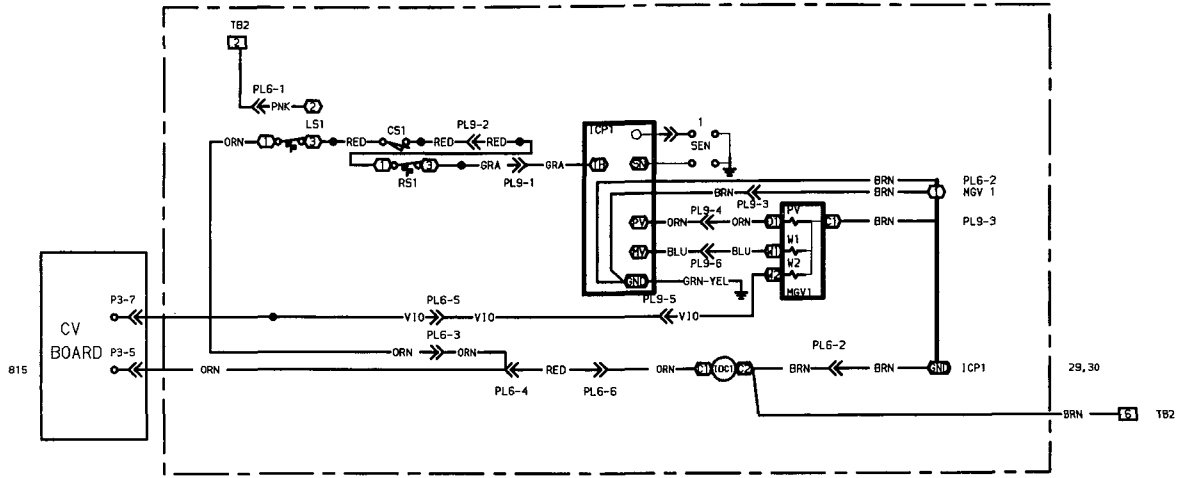
## LEGEND AND NOTES FOR FIG. 36 AND 37

<b>AFS</b> — Airflow Switch <b>APS</b> — Air Pressure Switch <b>C</b> — Contactor, Compressor <b>CB</b> — Circuit Breaker <b>CCB</b> — Control Circuit Breaker <b>CH</b> — Crankcase Heater <b>CLO</b> — Compressor Lockout <b>COMP</b> — Compressor Motor <b>CS</b> — Centrifugal Switch <b>CV</b> — Constant Volume <b>DMS</b> — Damper Motor Switch <b>DU</b> — Dummy Terminal <b>EC</b> — Enthalpy Control <b>ECON</b> — Economizer <b>EFM</b> — Exhaust Fan Motor <b>EQUIP</b> — Equipment <b>FLA</b> — Full Load Amps <b>GND</b> — Ground <b>GR</b> — Gas Relay <b>HC</b> — Heater Contactor <b>HPCT</b> — Head Pressure Control  <b>HPS</b> — High-Pressure Switch <b>HR</b> — Heat Relay <b>HV</b> — High Voltage	<b>I</b> — Ignitor <b>ICP</b> — Ignitor Control Pack <b>IDC</b> — Induced Draft Contactor <b>IDM</b> — Induced Draft Motor <b>IFC</b> — Indoor (Evaporator) Fan Contactor <b>IFCB</b> — Indoor (Evaporator) Fan Circuit Breaker <b>IFM</b> — Indoor (Evaporator) Fan Motor <b>LPS</b> — Low-Pressure Switch <b>LS</b> — Limit Switch <b>MAT.</b> — Mixed Air Thermostat <b>MGV</b> — Main Gas Valve <b>OFC</b> — Outdoor (Condenser) Fan Contactor <b>OFM</b> — Outdoor (Condenser) Fan Motor <b>P</b> — Plug Assembly <b>PEC</b> — Power Exhaust Contactor <b>PG</b> — Pilot Gas <b>PGV</b> — Pilot Gas Valve <b>PI</b> — Plug Assembly <b>PV</b> — Pilot Valve <b>QT</b> — Quadruple Terminal <b>RS</b> — Rollout Switch <b>SC</b> — Safety Circuit	<b>SEN</b> — Sensor <b>SW</b> — Switch <b>TB</b> — Terminal Block <b>TRAN</b> — Transformer <b>V</b> — Voltage   Terminal (Marked)  Terminal (Unmarked)  Terminal Block  Splice  Spliced (Marked)  Factory Wiring  Field Control Wiring  Field Power Wiring  Accessory or Optional Wiring  To indicate common potential only, not to represent wiring/
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### NOTES

1. CB Must Trip Amps are equal to or less than 140% FLA.
2. If any of the original wire furnished must be replaced, it must be replaced with Type 90 C wire or its equivalent.
3. Number(s) indicate the line location of contacts. A bracket over (2) numbers signifies single pole, double throw contacts. An underlined number signifies a normally closed contact. Plain numbers (no lines) signify a normally open contact. Line numbers 1-500 are located on power schematic, 501-800 are on 115-v control schematic, 801 and on are on 24-v control schematic.
4. Condenser-fan motors are thermally protected.
5. Three-phase motors are protected under primary single-phasing conditions.
6. Tran 1 and 2 are wired for 460 v on 460-v units and for 208 v for 208/230-v units. If 208/230-v units are to run with 230-v power supply, the control circuit transformer must be rewired as follows: disconnect the BLU and YEL wire on TRAN 1 and connect to . Also disconnect the BLU wire on TRAN 2 and connect to 230-v lead.

LOW-HEAT (48LJD)



HIGH-HEAT (48LJE)

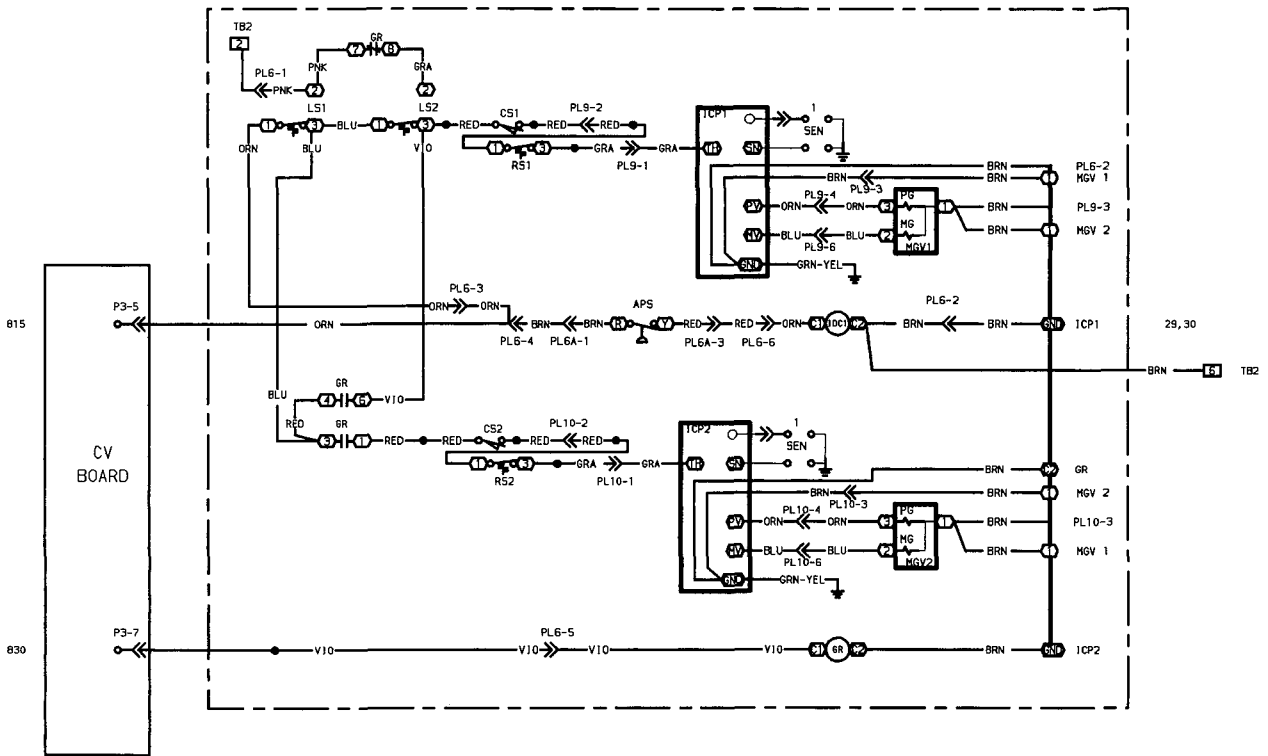
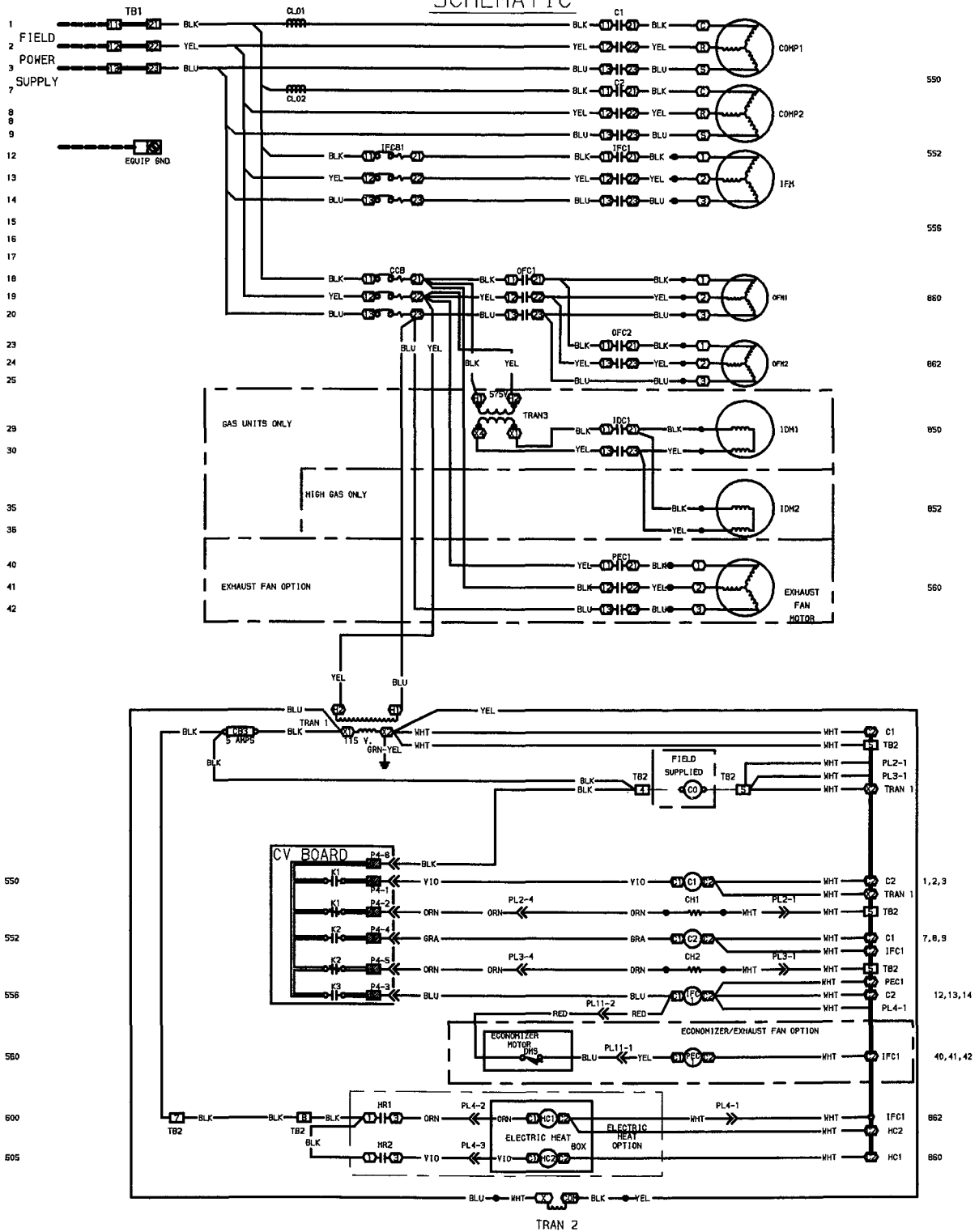


Fig. 36 – Gas Heat Sections, Models 48LJD,LJE024

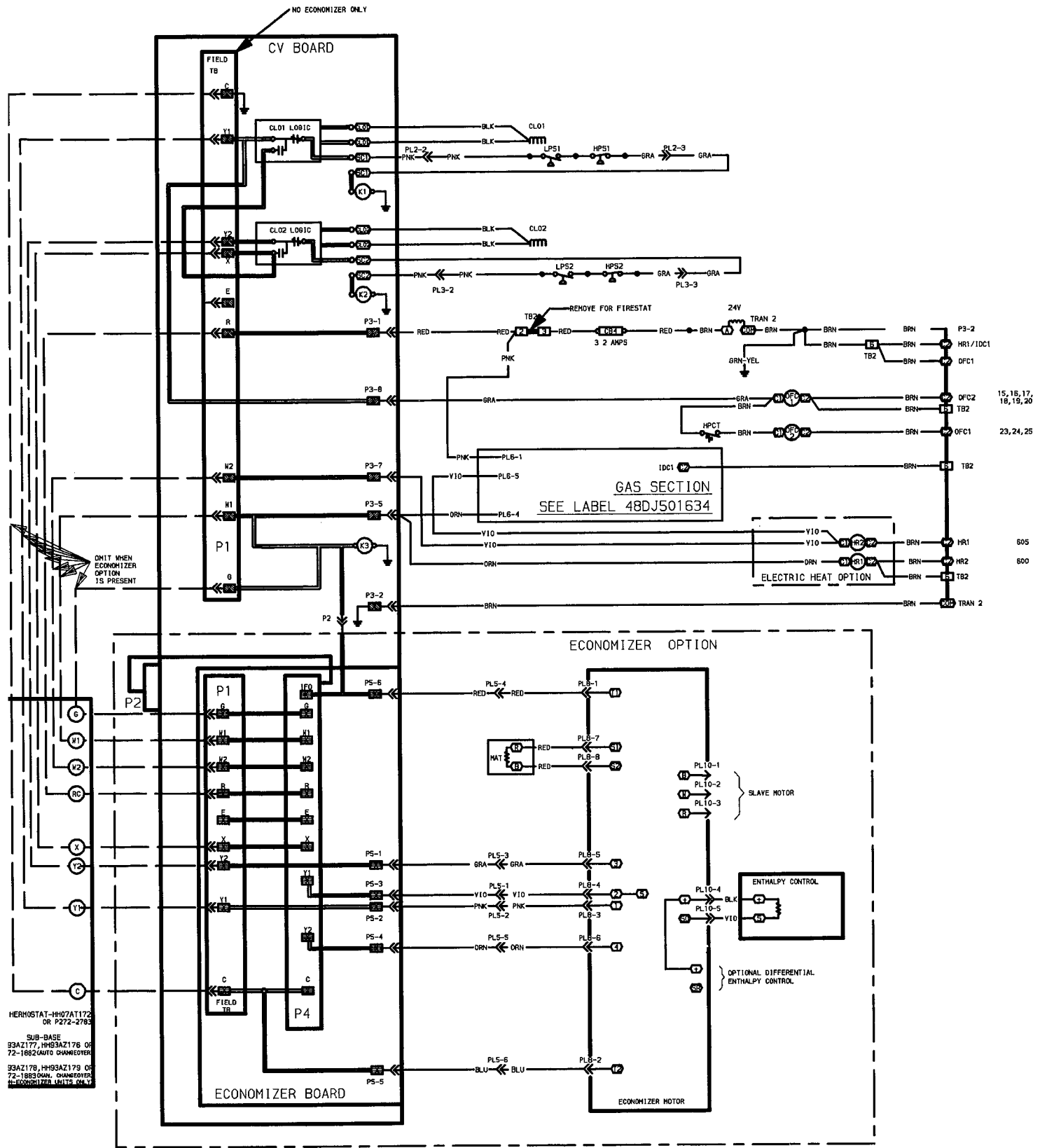
# SCHEMATIC



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1, 2, 3  
7, 8, 9  
12, 13, 14  
40, 41, 42  
560  
562

Fig. 37 — Typical Wiring



50LJ\_500\_\_\_154 -

ig Schematic, 208/230, 460-V Units

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